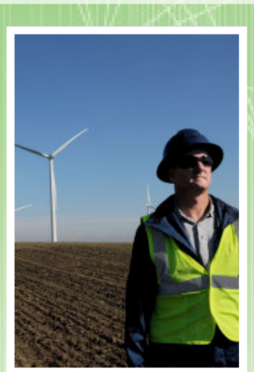
Navigating EPA's Clean Power Plan for Compliance With Renewable Energy



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Foreword

US EPA has made clear that state clean energy programs—including those related to renewable energy—can contribute to a state's Clean Power Plan compliance. Renewable energy tracking systems, together with state policies designed to increase the production and use of renewable energy, will provide one key element to helping states reduce the carbon intensity of their power sector.

In this paper, the Center for Resource Solutions and the Regulatory Assistance Project have collaborated to help readers to understand some of the ways in which states are using renewable energy today, and appreciate how existing renewable energy compliance practices provide well-established and suitable approaches for regulators to use as part of their efforts to demonstrate compliance under the Clean Power Plan.

We hope that this paper will be helpful as you work through these issues.

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I. Introduction

On June 2, 2014, the U.S. Environmental Protection Agency (EPA) announced its proposed performance standards for reducing carbon dioxide (CO_2) emissions from existing power plants under Clean Air Act Section 111(d).[2] In proposing the Clean Power Plan, EPA describes a strategy that attempts to leverage and expand already-occurring clean energy investment in the U.S:

> States, cities and businesses across the country are already taking action to address the risks of climate change. EPA's proposal builds on those actions and is flexible—reflecting that different states have a different mix of sources and opportunities, and reflecting the important role of states as full partners with the federal government in cutting pollution.[3]

The Clean Power Plan would establish CO_2 emission goals for each state which EPA developed by analyzing programs developed by individual states and CO_2 emission reduction strategies available across the country. EPA has emphasized repeatedly that this approach will ensure that states have the flexibility they need to meet these goals.

While flexibility is an important feature of the Clean Power Plan, so is the need for states to demonstrate that they are actually meeting its objectives. Considering these competing goals—flexibility and enforcement—state compliance should be viewed as an effort at balancing greater flexibility with achievement of Clean Power Plan goals.

The purpose of this paper is to help energy and environmental regulators understand the manner in which a state's clean energy programs—specifically, those related to renewable energy (RE)—might contribute to a state's planning for compliance with the Clean Power Plan. The paper is designed to help readers understand some of the ways in which states are using RE today, and appreciate how RE might be used to demonstrate compliance under the Clean Power Plan.

It should be noted that the paper does not necessarily propose that compliance can or should be met entirely with RE, although renewable resources possess distinct advantages over other approaches that states may consider. It is an assumption of this paper, however, that current RE compliance practices provide well-established and suitable pathways for regulators to use as part of their efforts to demonstrate compliance under the Clean Power Plan.

The main body of this report is divided into four substantive sections, followed by a conclusion. Section I introduces the Clean Power Plan and discusses the interplay of flexibility and likely enforcement requirements of state compliance plans. Section II explores potential goals and frameworks for state plans. In Section III, the discussion turns to the role for RE, how it can affect CO_2 emissions, and how these benefits can be recognized and incorporated into compliance plans. Section IV looks at how RE can be traded and accounted for under various state plan structures. The final section, reviews likely compliance requirements and concludes that states will be able to use RE to demonstrate compliance with Clean Power Program standards.

Key takeaways:

- The ability to track renewable generation is critical to demonstrating Clean Power Plan (CPP) compliance with RE and avoiding double counting.
- Renewable Energy Certificates (RECs) and existing RE tracking systems provide established mechanisms and protocols for tracking RE.
- REC ownership and retirement is an established means of demonstrating a claim to avoided emissions from RE.
- RECs for 111(d) compliance can be tracked, avoiding the need to create a separate accounting system.
- Voluntary green power programs and related REC purchases should not be included in state plans, as they are marketed as steps going beyond established regulatory programs.

II. The Clean Power Plan—Flexibility and Enforcement

EPA estimates that the Clean Power Plan could reduce power sector emissions by 30 percent from 2005 levels by 2030. The Plan establishes numeric emissions goals for each state,[4] and requires each state to develop and submit a compliance plan (state plan) for EPA's approval that articulates how the state will enforce its emissions goals.[5] EPA's proposal enables states to fashion their state plans in a manner that best suits their situation, allowing the state significant leeway in how it develops a compliance approach to the Clean Power Plan.

EPA's proposal is expected to be finalized in mid-2015, and state plans will be due one year later. States will also have the opportunity to seek a one-year extension. Multi-state compliance planning efforts are allowed a two-year extension. Once approved plans are in place, states will be required to report progress toward achieving their goals at least every two years until 2030.

EPA's authority to develop the Clean Power Plan comes from section 111(d) of the Clean Air Act, which directs EPA to identify the "best system of emission reduction" (BSER).[6] In defining BSER, EPA took an expansive view, starting with individual generation units, then including clean energy practices across the electric system, all of which contribute to reductions in electric sector CO_2 emissions. EPA identified four principal categories of compliance measures, which it calls "building blocks":

1. Reducing the carbon intensity of generation at individual affected electric generating units (EGUs) through heat rate improvements.
2. Reducing emissions from the most carbon-intensive affected EGUs in the amount that results from substituting generation at those EGUs with generation from less carbon-intensive affected EGUs (including natural gas combined cycle units under construction).
3. Reducing emissions from affected EGUs in the amount that results from substituting generation at those EGUs with expanded low- or zero-carbon generation.
4. Reducing emissions from affected EGUs in the amount that results from the use of demand-side energy efficiency that reduces the amount of generation required.[7]

The EPA reasoned that because they "either result in improved operating efficiency or support reductions in mass emissions at existing EGUs, each of the four building blocks represents a demonstrated basis for reducing CO_2 emissions from affected EGUs that is already being pursued in the power sector."[8] However, EPA has also indicated that state strategies for reducing CO_2 emissions should not necessarily be limited to the four listed building blocks:

> If a state prefers not to attempt to achieve the level of performance estimated by the EPA for a particular building block, it can compensate through over-achievement in another one, or employ other compliance approaches not factored into the state-specific goal at all.[9]

While EPA's proposal reflects a willingness to accommodate states in the many ways that they might comply, there is one obvious limit to this flexibility. EPA's proposal is tempered by the need for states to be able to propose a plan that can be enforced.

In its proposal, EPA provides guidance to states as to the level of enforceability that will be required of state plans.[10] EPA has also asked for comment on the guidance it has provided, leaving the door open as to what level of enforceability will ultimately be expected. The proposal recognizes that, given the various entities whose contributions could be required to make state plans work, EPA needs to consider how exactly it will articulate the appropriate levels of enforcement that it wants to see in state plans (see the discussion of "frameworks" below at notes 16–17 and accompanying text).

Historically, EPA has required states to describe how proposed emissions standards will be "quantifiable, non-duplicative, permanent, verifiable, and enforceable…".[11] While, under the Clean Power Plan, EPA appears open to the manner in which states develop plans, including demonstrating enforceability, state regulators should understand that in the past EPA has identified an acceptable emission standard as being:

- Quantifiable, if it can be reliably measured, with technically sound methods, in a manner that is replicable.
- Non-duplicative if, with respect to an affected entity, it is not already part of another state plan for compliance with federal air pollution regulations.

- Permanent, if the standard must be met for each applicable compliance year or period.
- Verifiable, if adequate monitoring, record-keeping and reporting requirements are in place to enable independent evaluation, measurement and compliance verification.
- Enforceable
  - If the standard represents a technically accurate limitation or requirement and the time period for the limitation or requirement is specified.
  - Compliance requirements are clearly defined.
  - Affected entities responsible for compliance and liable for violations are identified.
  - Each compliance activity or measure is "practically enforceable" in accordance with EPA guidance.[12]
  - EPA and the state maintain the ability to enforce against violations and secure appropriate corrective actions.

As states develop compliance plans, they will need to consider, on the one hand, the extent to which they wish to exploit that flexibility, and on the other, how that flexibility will interact with the necessary enforcement limitations contained in their state program.

III. State Plans: Rate-Based Goals or Mass-Based Equivalents

In its June 2014 proposal, EPA sets out rate-based emissions goals for states to meet by 2030, but EPA has made it clear to states that they can meet the emissions goals with mass-based equivalents, referring to these two approaches as "pathways."[13]

In November, EPA issued a technical support document[14] describing two approaches for translating emission rate-based goals to a mass-based equivalent, emphasizing that the approaches are illustrative and implying that states have significant leeway in how they make the translation.[15] Regulators should understand, therefore, that achievement of a state's emissions goal can be demonstrated through two distinct approaches, as a rate (lbs./MWh) or an equivalent mass-based measure (tons/year), each of which comes with different advantages and challenges.

The flexibility for states to choose between a rate-based and a mass-based approaches, creates the potential for double counting reductions from RE between states. Tracking of renewable energy is therefore critical in both rate- and mass-based states to prevent double counting.

Plan Frameworks—Who are the Responsible Parties?

In addition to providing states with alternative pathways, i.e., the flexibility to articulate emissions goals as rate- or mass-based equivalents, EPA further provides states with a choice in the framework they adopt for state plans. One framework would apply directly to affected generators and could be built around either of the two pathways described above. Under this traditional framework, end-use energy efficiency and RE measures that avoid generator CO_2 emissions "could be a major component of a state's overall strategy for cost-effectively reducing … CO_2 emissions."[16]

EPA refers to an alternative framework as a "portfolio approach," which could include generation emission limits for other entities and various programs and measures such as "other enforceable end-use energy efficiency and renewable energy measures" that avoid

Figure 1. **Different Illustrative Plan Approaches**[19]

Rate-Based Plan (Simple)	Rate-Based Plan (More Complex)	Mass-Based Plan (Simple)	Mass-Based Plan (More Complex)
• CO_2 rate limit applied directly to EGUs	• CO_2 rate limit applied directly to affected EGUs ➢ Credit for EE/RE can be used toward compliance	• CO_2 mass emissions limit applied directly to affected EGUs	• Portfolio of measures applied to meet a mass CO_2 goal ➢ Translation from rate goal to mass goal (plan includes basis and supporting analysis)
• Responsible party is EGU owner/operator (subject to state regulations) • Demonstration of compliance based on monitoring and reporting of EGU stack CO_2 emissions and MWh output	• Responsible party is EGU owner/operator (subject to state regulations), along with: ➢ Electric distribution utility with regulatory obligations under state EERS and RPS • Demonstration of compliance based on: ➢ Monitoring and reporting of EGU stack CO_2 emissions and MWh output, and ➢ EM&V for EE/RE to determine "credits" that can be used to adjust CO_2 rate when demonstrating compliance	• Responsible party is EGU owner/operator (subject to state regulations) • Demonstration of compliance based on monitoring and reporting of EGU stack CO_2 emissions	• Responsible parties include: ➢ State (ultimate responsibility for achieving goal) ➢ Electric distribution utility with regulatory obligations under state EERS and RPS ➢ EGU owner/operator (for emission limit component) • Demonstration of plan performance based on monitoring and reporting of EGU stack CO_2 emissions

emissions.[17] EPA also indicates that the portfolio approach can be either state- or utility-run.[18] (See Fig. 1).

As the discussion above illustrates, the manner in which RE might be used for compliance will first depend on how states choose to configure their programs, including the emissions goals, the pathways and the frameworks they adopt.

III. A Role for Renewable Energy

Whether a state chooses to articulate its goals as an emissions rate or as a mass-based equivalent, or adopts a generator-based or portfolio based structure for its state plan, RE constitutes a significant means of compliance for states to consider as they prepare for EPA to finalize its Clean Power Plan proposal this summer. This point is illustrated in a 2013 letter from the California Air Resources Board to EPA:

> The integrated nature of the power grid means that policies which displace the need for fossil generation can often cut emissions from covered sources more deeply, and more cost-effectively than can engineering changes at the plants alone, though these source-level control efforts are a vital starting point.[20]

Numerous commentators have explored how RE can affect the dispatch of electric generation, and how—as RE displaces fossil resources—it can lower prices and marginal emissions.[21] While rules and practices for organized wholesale markets are highly detailed, as illustrated below, these markets generally respond in the following way to the introduction of renewable resources:[22]

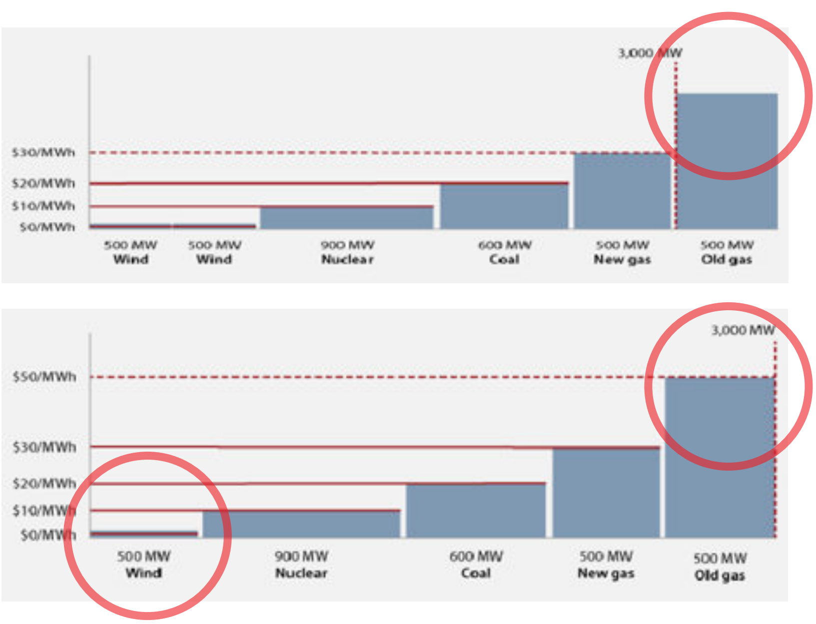
- Generators indicate to the system operator how much energy they can provide and at what cost.
- Electric distribution companies indicate how much energy they need.
- Then the system operator "stacks up" the generation bids on the basis of cost, from the lowest to the highest, in an amount of generation that corresponds to the total amount of energy needed.

When the system operator adds up all the power that distribution utilities have called for, the final or highest price offer that is accepted becomes what is referred to as the "marginal" or "clearing" price. And it is this price that all the generators whose bids have been accepted will receive and that all power companies will pay.

As illustrated in the two figures below, the marginal price changes from $50 to $30 per megawatt hour (MWh) when a lower cost resource (500MW of wind) is added at the bottom (the left) of the bid stack. In the example, the total amount of energy called for and supplied does not change. However, because the original marginal generator, labeled "Old gas," is displaced by the "New gas" power plant, the addition of 500 MW of the renewable resource lowers both the marginal price and also the marginal emissions due, respectively, to the marginal unit's lower cost and greater efficiency See Fig. 2)

Even in traditionally regulated utilities, a similar analysis takes place among decision-makers. If a less expensive resource is available and can be accommodated by the system, then it will replace a more expensive resource. Fossil resources, in comparison to solar or wind generation, generally have higher operating costs, including fuel costs. Renewable resources are economically attractive because their operating costs are very low and, when the sun shines or the wind blows, typically other more expensive and often more carbon-intensive generation resources are curtailed or not dispatched at

Figure 2. **Marginal Prices**[23] [24]



all.[25] It should be noted, however, that while renewable resources can create this displacement effect with marginal units, this effect may not extend to some baseload plants like nuclear generation which also have relatively low operating costs.

How Renewable Energy is Currently Used

As noted earlier, the Clean Power Plan is designed to build upon clean energy policies developed by states. Building Block Three reflects this intent and focuses on measures that reduce emissions through the promotion of low- or non-emitting generation.[26] RE is part of this category and includes new and existing utility-scale renewables and other distributed renewable resources.

As illustrated in Figure 3, nearly 30 states have adopted Renewable Portfolio Standards (RPSs), a mandatory requirement for jurisdictional retail electricity companies to supply a certain amount of energy from renewable generation sources. Nine states have renewable portfolio goals (See Fig. 3).[27]

RPSs provide various approaches for demonstrating compliance. Jurisdictional companies, generally retail utilities, can demonstrate ownership of the electrical output of a renewable generation facility, and the ownership and retirement of corresponding renewable energy certificates (RECs), a tradable instrument designed to reflect a unit of output from a renewable resource.[29] Companies can also simply purchase and retire the RECs from a renewable project that qualifies under the relevant state statute, without purchasing the electrical output.[30]

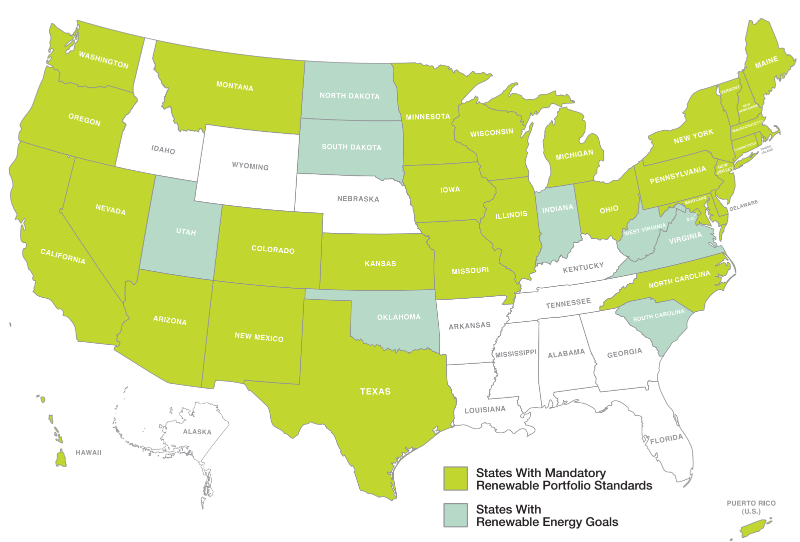
In addition to having their own definitions of "renewable," state RPSs have differing rules about the acceptable location of renewable resources from which RECs can be acquired.[31] A common rule appears to be that a REC is acceptable for RPS compliance if the resource it represents can deliver electricity into the REC purchaser's state or region. For example, the state of Oregon requires a REC to be from a project that can deliver power into the Bonneville Power Administration, the transmission system of the relevant electric utility, or to a "delivery point designated by an electric utility for the purpose of subsequent delivery to the electric utility…".[32] By contrast, since Hawaii or nearly all of Texas are not connected to the rest of the country, RPSs with this deliverability rule could not honor RECs from renewable projects originating in those states.[33]

Keeping Track of Renewable Energy

State PUCs typically require annual compliance reports from retail electricity providers subject to an RPS, and both rely upon existing REC tracking systems as a means of demonstrating compliance. They are needed to prevent double counting. RECs are important in this context because the Clean Power Plan will likely require states to demonstrate where reductions come from, how reductions are achieved and that they have not been double counted.

Most states use regional tracking systems to facilitate the issuance, tracking, and retirement of RECs for RPS compliance (see Fig. 4). Tracking systems are also used nationwide to ensure the legitimacy of voluntary renewable marketing claims. Tracking systems in the U.S. were developed out of stakeholder processes with the help of air and energy regulators, regional transmission operators, generation owners, and utilities, and could continue to be relied upon as a means of demonstrating compliance for purposes of the Clean Power Plan (See Fig. 4).[34]

Figure 3. State Renewable Portfolio Standards and Goals[28]



RE is generally tracked by the megawatt-hour (MWh) through existing tracking systems developed to provide a robust means of establishing REC ownership and demonstrating REC retirement, the duel keys to ensuring against double counting of RECs. As shown in Figure 5, a REC can be sold separately from the underlying electrical energy because the tracking system separates the two: one MWh of wind generation becomes a REC, (a tradable MWh of wind) and one MWh of energy. RECs have individual serial numbers and can contain other identifying information such as plant name and location, month and year of generation, fuel type, and emissions rate (lbs. per MWh).

The precise content of a REC is typically defined by state law, but usually includes all ownership rights to the generation attributes, including a carbon-free emissions profile.[36] Under Kansas law, for example, a REC that can be used toward the state RE requirement is defined as "a certificate representing the attributes associated with one megawatt-hour

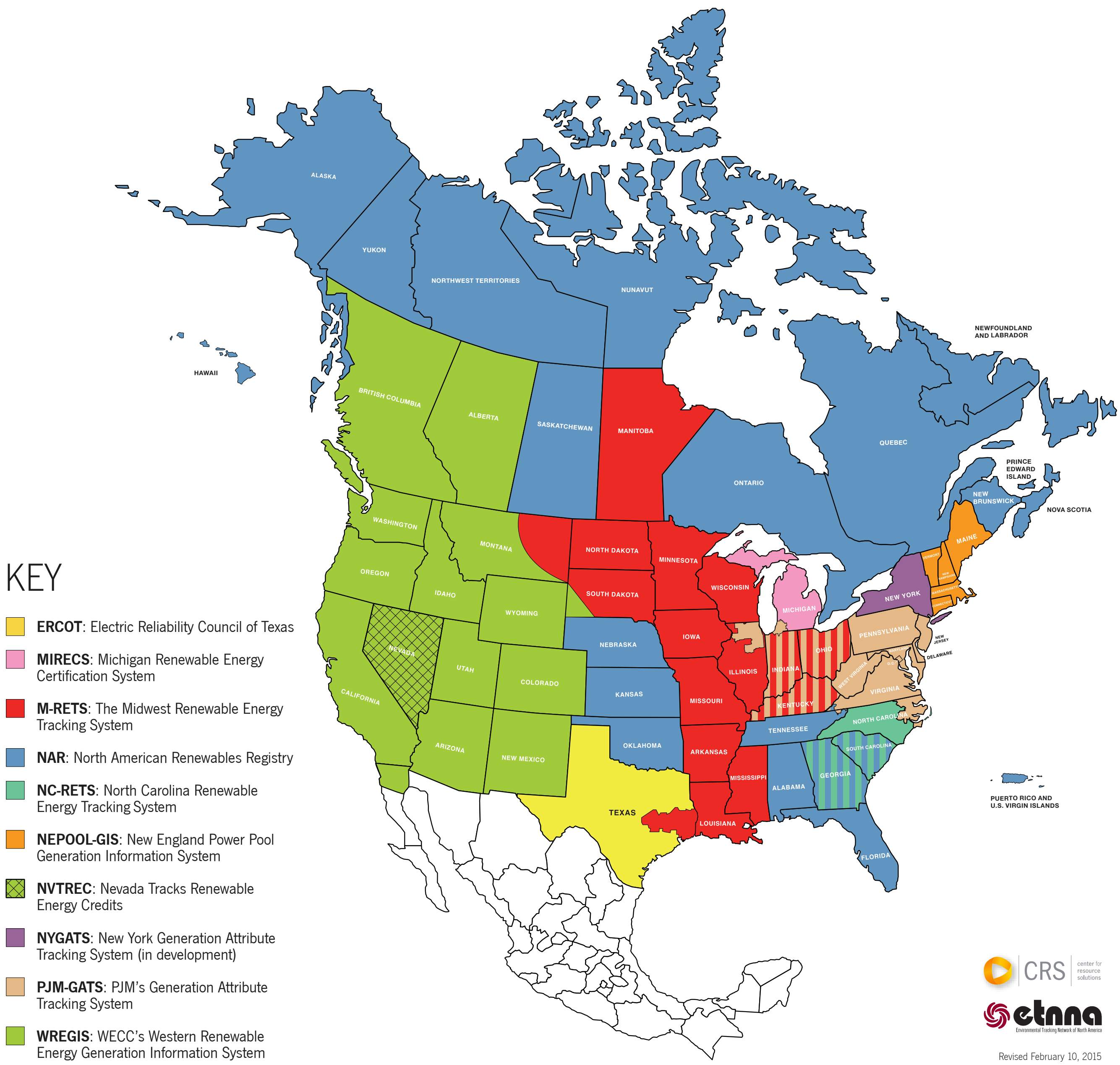


Figure 4. North American Renewable Energy Tracking Systems[35]

(MWh) of energy generated by a renewable energy resource that is located in Kansas or serves ratepayers in the state."[37]

In order to take credit for the avoided carbon benefits associated with the MWh of renewable generation, the entity responsible for compliance would need to hold a REC to reflect that production. By assigning a unique serial number to each MWh of renewable generation, the tracking systems have the capability to ensure that each REC is used only once, and consequently that credit is claimed only once.

Reflecting Renewable Energy in a State Program—Determining Avoided Emissions

EPA has indicated that, in demonstrating achievement of the requisite emission performance level in its plan, a state program could reflect the effects of RE measures in various ways: in an individual generator's demonstrated CO_2 emission rate, the CO_2 emission rate of a cohort of generators, or in various programs and measures that avoid emissions.[38] This flexibility provides states with the ability to use these adjustments to reflect emissions changes broadly ranging from a specific generating unit, a power pool, other "identified region,"[39] or "elsewhere in the interconnected electric system…".[40]

Calculating avoided emissions in this context requires a determination of MWhs produced and avoided, and an understanding of the relevant CO_2 emission rate for the power pool or region. The proposed Clean Power Plan has not been prescriptive in this regard and notes that the "CO_2 emission rate could be based on the average or marginal emission rate in the power pool, region, or state."[41]

While EPA's proposed rule encourages flexibility, there are common ways to quantify avoided CO_2 emissions from RE programs, approaches that range from the use of emissions factors to sophisticated modeling.[42] If avoided emissions data for renewable resources are available, regulators will need to know how they were developed in order to assess their suitability. If such data are unavailable, regulators will need to be able to develop their own avoided emissions estimates. The three most widely used methods are based on "average emissions," "marginal emissions," and "dispatch modeling."[43] For a brief description of these three approaches, the reader can turn to Appendix Two—Calculating Avoided Emissions.

Accounting for Renewables in State Plans

Now that the reader has a general sense of the different approaches for structuring state plans, tracking RE, and characterizing associated avoided emissions, we now consider how RE could be accounted for under each of these three pathways. In general, a state will have to submit a plan to EPA that shows how the state will meet the future emissions limits. The plan would also explain the basis for those expectations. And in future years the state will have to demonstrate how it has met the limits in its plan.

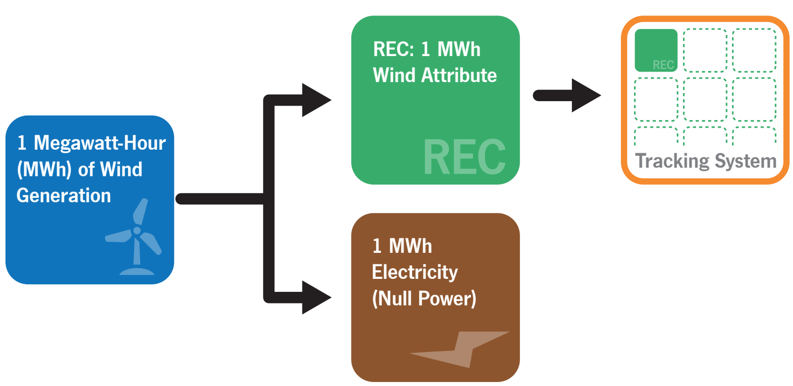
Adjusting an Emissions Rate's Denominator

If a state chooses a rate-based pathway (lbs/MWh), it will have to show that the measures it chooses will reduce its CO_2 emission rate, expressed in lbs of CO_2/MWh of generation. Under the first version of a rate-based pathway, RE could be used to adjust an emission rate's denominator. A state plan would calculate an adjusted emissions rate, in any given year using a formula like:

CO_2 Emissions Rate$_n$ = Lbs CO_{2n} / (MWh$_n$ + MWhRE$_n$), where

> CO_2 Emissions Rate$_n$ is the adjusted CO_2 emissions rate in year n;
>
> Lbs CO_{2n} is the lbs of CO_2 emissions from affected generating units in year n;

Figure 5. Two Commodities: the Certificate and the Energy



MWh_n is the MWhs of generation in year n, and;

$MWhRE_n$ is the MWh of renewable energy in year n

As an example, assume a generator with a stack emission rate of 1,500 lbs CO_2/MWh generates 1,000 MWh. Also assume that 1,000 emission-free MWh RECs for the effect of renewable generation are credited to the generator when calculating its adjusted CO_2 emission rate. The calculation would look like:

CO_2 Emissions $Rate_{adj}$ = (1000 MWh * 1500 lbs/MWh) / (1000 MWh + 1000 MWhRE) = 750 lbs/MWh

The adjusted CO_2 emission rate is 1,500,000 lbs CO_2 divided by 2,000 MWh, which equals a CO_2 emission rate of 750 lbs CO_2/MWh.

Adjusting an Emissions Rate's Numerator

CO_2 Emissions $Rate_n$ = (Lbs CO_{2n}-Lbs Marginal CO_2 $avoided_n$)/ MWh_n, where

CO_2 Emissions $Rate_n$ is the adjusted CO_2 emissions rate in year n;

Lbs CO_{2n} is the lbs of CO_2 emissions from affected generating units in year n;

Lbs Marginal CO_2 $avoided_n$ is the calculated avoided emissions resulting from the operation of non-emitting generation.

MWh_n is the MWhs of generation in year n.

As an example, assume a generator with a stack emission rate of 1,500 lbs CO_2/MWh generates 1,000 MWh. Also assume that 500 RECs, determined to have avoided CO_2 at a rate 800 lbs/MWh, are credited to the generator when calculating the generator's adjusted CO_2 emission rate. The calculation would look like:

Figure 6. **Counting Renewable Energy in Rate-Based Programs**

	For illustrative purposes: Using 2 RECs @1,000 lbs. /MWh of avoided emissions each[48]	**Seller State** (State Where RE Gen is Located)		**Buyer State** (State Where Attribute is Sold)
		Adjustment to Numerator of Rate	**Adjustment to Denominator of Rate**	
1	RECs generated and retired in the same Rate-Based state	Subtract 2,000 lbs. from the entity's numerator, or	Add 2 MWhs to the entity's denominator	N/A
2	RECs sold out of a Rate-Based state into another Rate-Based state	Not reflected in generating state's rate	Not reflected in generating state's rate	Subtract 2,000 lbs. from the entity's numerator (if rate-based program uses numerator adjustment methodology) or Add 2 MWhs to the entity's denominator (if rate-based program uses denominator adjustment methodology)
3	RECs sold out of a Rate-Based state into a Mass-Based state	Not reflected in generating state's rate	Not reflected in generating state's rate	See discussion of accounting adjustments required by mass-based programs.

CO_2 Emissions Rate$_{adj}$ = ((1,000 MWh * 1,500 lbs/MWh)—(500 MWhRE * 800 lbs/MWh)) / 1,000 MWh = 1,100 lbs/MWh

The adjusted CO_2 emission rate is 1,500,000 lbs CO_2 minus 400,000 lbs CO_2 credits divided by 1,000 MWh, which equals a CO_2 emission rate of 1,100 lbs CO_2/MWh.

Adjusting a Mass Emissions Budget

Under the second pathway where an emissions limit is set as a mass-based equivalent (tons/year), the state plan would project a limit on emissions from affected generators. For example, the Regional Greenhouse Gas Initiative (RGGI) is a mass-based program and has an emissions budget of 91,000,000 short tons.[44]

The plan would also explain the basis for those expectations. So the limit is not just a goal, it is a limit developed through a planning exercise which would include an explanation as to how RE generation (e.g. RPS and net-metering policies) will be deployed to meet load growth and offset emissions from affected generators. In future years, the state would demonstrate compliance using actual values of emissions from affected generating units. For example, in 2013 measured CO_2 emissions from the 167 power plants covered by RGGI totaled 86,568,410 short tons.[45] In its plan, the state would not have to account specifically for RE MWh or RE avoided lbs.

IV. Regional Trading of Renewables under 111(d)

While states have developed various RE policies such as RPSs and net-metering programs that will help them comply with 111(d), RE markets operate beyond individual state borders on a regional basis. If RE is going to serve a compliance role for states, it is important to understand how these well-established trading patterns would work between states with 111(d) equivalency programs, and to what degree any impediments to trading might arise.

Rate-Based Programs

As discussed above, rate-based programs using RECs have the option to include RE in their rates in several ways, either reflecting it as added zero-emission MWhs or as avoided lbs. of CO_2 (see Fig. 6).[46] When RECs are sold out of a rate-based state, the "seller" state would not need/get to make any adjustment to its rate. The MWh and any carbon attribute, i.e. the ability to make a claim regarding the energy production, travels with the REC and is accounted for when the REC is retired by the buyer as part of his or her compliance. The "buyer" intending to use the REC for compliance—if located in a rate-based program—will need to engage in the same accounting steps that would apply to any rate-based state (see Fig. 6), and adjust for either added zero-carbon MWhs or avoided lbs.[47] Complications associated with a mass-based buyer state are discussed below (see Fig. 6).

Mass-Based Programs

A mass-based program automatically recognizes any generation effects of RE policies because it is structured to focus on total emissions.[49] This was noted by the RGGI states in their November 2014 comments to EPA, and described as an advantage because, under a mass-based program:

> Complementary RE and EE programs need not be separately quantified or accounted for, and would not become federally enforceable. As a benefit to this approach, a host of complexities associated with enforceability, accounting, and "double-counting" are altogether avoided by the EPA and the states.[50]

In determining a mass-based state's compliance, they note that EPA needs only to consider "whether the broader regional cap is met…".[51]

Despite these advantages, the RGGI states contend that trading the RE produced in their region would raise significant problems: "a double-counting issue could arise at the seams of rate-based and mass-based approaches."[52] Because a mass-based approach measures total tons, an attempt to trade RECs from the region would result in claiming emissions effects that are already being reflected in the total emissions numbers, and counting the emissions effects twice.[53]

Unless the trade of RE can first compensate for the automatic emissions effects of that RE, it would appear that trading RE out of a mass-based program is not feasible. The RGGI states have adopted a policy known as the "Voluntary

Renewable Set Aside" (VRSA) that addresses this issue by adjusting the program's cap under limited circumstances and for special purposes. While the following discussion does not recommend an extension of RGGI's VRSA policy in a 111(d) context, it is worth considering the mechanism itself—an allowance set-aside account—and the implications of applying it in a 111(d) context.

Today, RE marketers in the RGGI region make claims about the environmentally beneficial attributes of the RE that they sell on the voluntary market. In making those claims they have been able to substantiate that their resources are, in fact, displacing more carbon-intensive generators and actually avoiding CO_2 because of RGGI's willingness to make available (i.e. set aside) a limited amount of RGGI allowances for retirement in coordination with the retirement of RECs produced for the voluntary market.[54]

A set-aside is simply some fraction of the overall amount of tons earmarked for special use. Most RGGI states have adopted a VRSA account, and they periodically retire RGGI allowances (one ton of CO_2) in an amount that corresponds to the CO_2 displaced by the voluntary purchases of renewables in their state.[55]

In Vermont, for example,[56] companies that sell renewables on the voluntary market can demonstrate the amount of RE that they have sold by providing RECs for each MWh of RE.[57] The state's utility commission, the Public Service Board, adopts an emissions factor for the RECs (i.e. a characterization of the amount of emissions avoided for each MWh of renewable energy generated), and then authorizes the retirement of a corresponding amount of RGGI allowances. As a simple illustration, if it were determined that a REC represents the displacement of 1,000 pounds of CO_2, then for every two RECs, one RGGI allowance could be retired.

It is important to emphasize that RGGI's VRSA "policy" is limited to voluntary markets which are predicated on the notion that the person is paying for something that goes beyond what is needed for regulatory compliance.[58] It should also be noted that RGGI makes available a limited amount of allowances for this purpose and that marketers do not need to pay for them.[59] This paper does not recommend extending this policy for CPP purposes, or including voluntary renewable sales in compliance plans.

However, if, in a 111(d) context, states with a mass-based program were inclined to develop a set-aside "mechanism" for regulatory purposes, they would need to address a number of significant issues including determining a suitable regulatory approach for characterizing avoided CO_2 emissions, incorporating the costs of retiring CO_2 allowances, and coordinating the process along with RECs as they are traded. The purchasing state would be able to claim the avoided emissions as long as the mass-based state properly reports the disposition of allowances. The mass-based state would have to show how allowances were retired to reflect emissions from the mass-based state's generators, and how allowances were retired from the set-aside account because they were used to reflect the RE used for compliance in another state. With those caveats, a REC could be traded out of a mass-based program, and an entity in a rate-based program could then legitimately use the REC to either adjust the numerator (CO_2) or denominator (MWh) of its rate.

From a technical standpoint, such an approach could support the regional trading of RECs in this context. It could also meet the standard that the RGGI states articulated prohibiting "rate-based states from taking credit for renewable generation that is already accounted for under the cap of a mass-based state." To the degree that allowances are purchased and retired, the program emissions budget could be adjusted downward, eliminating the option to emit and making those tons unavailable to the program. While the technical aspects of such an approach could be developed thereby enabling trading of RECs from a mass-based program to other states, characterizing the economics of such an approach are beyond the scope of this paper.

Conclusions

EPA's Clean Power Plan is designed to build on clean energy policies that states across the country have developed and refined, including policies to develop RE. EPA has described its proposal as flexible because it reflects "that different states have a different mix of sources and opportunities," and emphasizes the "role of states as full partners with the federal government in cutting pollution."[60]

EPA's proposal also can be expected to require states to demonstrate that they are actually meeting the objectives of their clean power programs. With regard to rate-based programs, this means substantiating the attainment of the goals and emissions effects of various RE policies such as RPSs and net-metering. For mass-based programs, it means demonstrating the achievement of program emissions goals.

The ability to track renewable generation is critical to demonstrating Clean Power Plan compliance with RE and avoiding double counting. RECs and existing tracking systems provide the necessary mechanisms and protocols for doing this. REC ownership and retirement is an established means of demonstrating claims to avoided emissions from RE. And RECs can be tracked for purposes of Clean Power Plan compliance, avoiding the need to create a separate RE accounting system.[61]

When one considers the potential criteria against which state plan compliance will be measured, RE will be able to contribute to meeting relevant standards. Using RECs and existing tracking systems and tracking protocols, states will be able to demonstrate how the contribution of RE to meeting program emissions standards is "quantifiable, non-duplicative, permanent, verifiable, and enforceable…." [62]

Quantifiable

States will be able to meet the "quantifiable" criterion by using and retiring RECs, and by adjusting rates. In the case of mass-based programs, while the RE effects are not directly quantified, the total mass emissions are. In this way, states will be able to demonstrate that RE and its effects can be reliably measured with technically sound methods, and in a manner that is replicable.

Non-Duplicative [63]

EPA has indicated to states that their use of an RPS or other RE policy could be counted toward Clean Power Plan Compliance. Thus, relying on and expanding on existing RE policies where possible should not be considered duplicative.

Permanent

The use of RECs, REC tracking systems, and relevant protocols, including those related to REC retirement, can help states ensure that avoided tons of CO_2 are permanent and that relevant standards are met. Mass-based programs perform a similar function with program allowances.

Verifiable

Avoided tons of CO_2 can be deemed as verifiable, because tracking systems provide a platform for monitoring, recordkeeping, and reporting which can be independently measured and evaluated. Mass-based programs require a demonstration that the program has met emissions standards, part of which requires generators to surrender for retirement allowances in an amount that reflects their total emissions.

Enforceable

RE quantified and verified as described can ensure that its contribution to state compliance is enforceable, and that it meets enforceability criteria. RPSs and other state RE policies constitute standards that represent clearly defined and "technically accurate limitation or requirements" and are currently practically enforceable under existing state policies and would continue to be as part of a state compliance plan.[64] Rather than focusing on specific energy policies such as those that promote RE, mass-based programs need only enforce emissions limits.

Accounting for RE attributes as set out here will not only afford states the flexibility to develop or further develop RE in their states, but also to establish a framework for ensuring that those RE goals are met and enforceable in the context of the Clean Power Plan.

Appendices

Appendix One—The Maryland Voluntary Renewable Set-aside Account

The Maryland Department of the Environment (Department) is responsible for administering Maryland's Voluntary Renewable Set-Aside process.[65] Maryland regulations allow for marketers that accumulate RECs equal to one or more tons of CO_2 to submit documentation to the Department in exchange for permanent retirement of RGGI CO_2 allowances from the state's renewable set-aside account as long as the renewable energy for which the REC was made was produced in the RGGI region. The Department is required to do this at least annually.

The Department retires RGGI allowances in an amount equal to the number of MWhs of renewable energy represented by the RECs submitted to the Department by a marketer multiplied by an established emissions factor. The emissions factor relied upon is developed annually using the prior year's fuel mix data from PJM's Generation Attribute Tracking System or "GATS", i.e., the regional REC tracking system. A marketer has to submit the following documentation:

- A report from GATS demonstrating the transfer of RECs for retirement.
- Names of the state where the REC was created, the facility that generated the renewable energy (including relevant generator ID number, and fuel type).
- Any additional information required to demonstrate that the RECs purchased are not being credited in more than one state or to satisfy compliance with any state renewable energy portfolio standard program.

Maryland has established a limit on voluntary renewables claims that can be made against the set-aside account, but leaves open the opportunity to review the account level. The account is limited annually to 350,000 allowances and if allowances in the account are not used in one year, they can be carried over to the next. Maryland's budget for 2014 is 18,497,583 tons. The balance of the Maryland Voluntary Renewable Set-aside Account cannot exceed 350,000 allowances as set by regulation. So the set aside is approximately 1.89 percent of the overall budget.

Appendix Two—Calculating Avoided Emissions

EPA's proposed rule acknowledges that there are common ways to quantify avoided CO_2 emissions from renewable energy programs, approaches that range from the use of emissions factors to sophisticated modeling. The three most widely used methods are based on "average emissions," "marginal emissions," and "dispatch modeling." [66]

Average Emissions Methodology

An average emissions method develops an emission factor to characterize avoided emissions based on the average emissions that result in an area after the production of renewable energy. Typically, this approach would take the annual emissions of all of the generators operating within a defined geographic area and divide them by the aggregated annual net generation within the same area to get a "system average" emission rate.[67]

This approach assumes for simplicity's sake that, when a unit of renewable energy is produced within an area, the system operator will reduce the output of all generators by that amount. An annual average avoided emission rate provides a rough approximation because it assumes that the renewable resources reduce electric generation from all generating types on a proportional basis consistent with the generation mix in a region.

Variations on this approach are also possible. For example, one could use the average emissions rate of non-baseload generating units in lieu of the average of all generating units which assumes that all baseload generators are unaffected by the introduction of a renewable resource, but that all non-baseload generators will reduce their output in proportion to the amount of renewable energy introduced. This non-baseload approach is in fact preferred, because it is more representative of how the electric grid is actually managed.

Marginal Emissions

Marginal emissions methodologies for determining avoided emissions reflect an attempt to estimate avoided emissions by using the actual emissions rates of the specific electric generating units that are likely to operate less, based on historical data, when renewable energy is produced. As illustrated in Figure 7 (see note 27), a marginal unit is the most expensive unit running at any given time, and the rate of emissions from that unit is assumed to be displaced. When a less expensive generating source (such as a wind generator) comes on line, the system operator will reduce the output of the most expensive unit(s) operating at that time, the "marginal" unit. The actual reduction in system emissions depends on which generator is operating on this economic margin at the time that the renewable resource comes on line. This marginal unit may have an emissions rate that is higher or lower than the non-baseload system average.[68]

One way of applying a marginal emissions approach is to evaluate avoided emissions based on the hour-by-hour behavior of individual generating units in a region. This method uses historic hourly output of each generator and hourly demand for the entire system to derive the probability that each generator will be operating on the margin for any given level of system demand. These probabilities are then paired with historic hourly emissions data for each unit to estimate the emissions that will be avoided when renewable resources are dispatched in the future.[69]

Dispatch Models

Economic dispatch models are used to predict how the system will react under different scenarios; and they determine which generating units will be dispatched by the system operator to meet any given future load.[70] Unlike average and marginal approaches that assume future behavior will mirror past behavior, dispatch models are built around data inputs related to, for example, price, operating cost and demand. Because these models can forecast the output of each generator on the system, and each generator's emission rates are known, dispatch models are effective at characterizing emissions. Using this approach, analysts can model alternative scenarios—one including renewable energy and one without it—and estimate values for avoided emissions. It should also be noted that most of the dispatch models that might be useful for estimating avoided emissions are proprietary software products. These must be purchased from a private sector vendor or employed through engagement of a consultant possessing a license to use these products.

This has been a very brief description of methodologies to characterize avoided emissions. Figure 7 summarizes some of the significant strengths and limitations of each method.

Figure 7. **Comparison of Methods for Estimating Avoided Emissions**[72]

Method	Strengths	Limitations
Average Emissions	• Simplest and fastest method • Ideal for energy efficiency screening purposes	• Least accurate method • Assumes future system operation mirrors past system operation • Does not identify the specific locations where emissions will decrease • Does not account for hourly/seasonal variations in unit dispatch • Does not account for variations in unit dispatch based on total system load
Statistical/Hourly Marginal Emissions	• More realistic/accurate than average emissions method • Identifies the specific locations where emissions will decrease • Accounts for hourly/seasonal variations in unit dispatch • Accounts for variations in unit dispatch based on system load	• Assumes future system operation mirrors past system operation • More difficult than average emissions or capacity factor methods
Dispatch Modeling	• Most accurate method • Simulates the actual economic dispatch decisions made by system operators	• Most complex method; requires significant training and investment of time to use • Documentation often not available to the public • Necessary software licenses can be expensive

Notes

The author would like to acknowledge that, without the help and generous insights of his CRS and RAP colleagues, this paper would not have been possible. The author takes sole responsibility for its content.

2. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," June 18, 2014, 79 FR 34918-34919. (Guidelines).

3. EPA Fact Sheet: Clean Power Plan Flexibility, http://www2.epa.gov/carbon-pollution-standards/fact-sheet-clean-power-plan-flexibility

4. The Clean Power Plan applies not only to states but also Indian Country and U.S. Territories. For the sake of simplicity, and with no intended disrespect or omission, jurisdictions are referred to as "states" in this paper.

5. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," June 18, 2014, 79 FR 34918-34919. EPA also proposed a supplemental rule "Carbon Pollution Emission Guidelines for Existing Stationary Sources: EGUs in Indian Country and U.S. Territories; Multi-jurisdictional Partnerships," issued on October 28, 2014. (Supplemental Guidelines).

6. 42 U.S. Code § 7411 (a) (1), "The term 'standard of performance' means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated."

7. Guidelines, 79 FR 34918-34919, 34858.

8. Id.

9. Guidelines 79 FR 34918-34919, 34926.

10. Id. 79 FR 34918-34919, notes 283 at page 34909, citing to (1) September 23, 1987 memorandum and accompanying implementing guidance, ''Review of State Implementation Plans and Revisions for Enforceability and Legal Sufficiency,'' (2) August 5, 2004 ''Guidance on SIP Credits for Emission Reductions from Electric-Sector Energy Efficiency and Renewable Energy Measures,'' and (3) July 2012 ''Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans, Appendix F.''

11. Guidelines 79 FR 34918-34919, 34913.

12. In their plans, states will need to identify the affected entities responsible for meeting compliance obligations in the plan, and the means by which compliance will be met. States will also have to demonstrate that they have the legal authority to subject such entities to relevant requirements specified in the state plan. Id. at 34917.

13. In June, the EPA provided the basic information necessary to translate the emission rate-based CO_2 goals into mass-based equivalents. The EPA also included a technical support document titled Technical Support Document (TSD) for Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, Docket ID No. EPA-HQ-OAR-2013-0602, "State Plan Considerations," U.S. Environmental Protection Agency Office of Air and Radiation, June 2014, (June 2014 TSD)," that discusses the considerations, data and technical approaches that could be considered when doing this translation and focuses on one potential approach that states, areas of Indian country and territories could use.

14. Technical Support Document (TSD) for Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, Docket ID No. EPA-HQ-OAR-2013-0602 Translation of the Clean Power Plan Emission Rate-Based CO_2 Goals to Mass-Based Equivalents, U.S. Environmental Protection Agency, Office of Air and Radiation, November 2014. (Nov. 2014 TSD). One approach produces mass-based equivalents that apply to existing affected fossil fuel-fired sources, while the second approach produces mass equivalents that are inclusive of emissions from existing affected and new fossil fuel-fired sources. Id.

15. "These approaches should be viewed as two potential ways in which implementing authorities may wish to translate the form of the goal to a mass-based equivalent." Nov. 2014 TSD at page 1.

16. June 2014 TSD at pages 5-6.

17. Id.

18. Id.

19. June 2014 TSD, Table 1, page 6.

20. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," June 18, 2014, 79 FR 34918-34919, at page 34880 and note 206, citing to December 27, 2013 Letter from Mary D. Nichols, Chairman of California Air Resources Board, to EPA Administrator Gina McCarthy.

21. See, e.g., “Wind Power Helps to Lower Electricity Prices,” Richard W. Caperton October 10, 2012, Center for American Progress. http://www.americanprogress.org/issues/green/report/2012/10/10/41100/wind-power-helps-to-lower-electricity-prices/; Bob Fagan and others, “The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region” (Cambridge, MA: Synapse, 2012), available at http://cleanenergytransmission.org/uploads/Synapse%20MISO%20wind%20and%20transmission%20report%20update%208.31.2012.pdf; PJM, “Potential Effects of Proposed Climate Change Policies on PJM’s Energy Market” (2009), available at http://pjm.com/~/media/documents/reports/20090127-carbon-emissions-whitepaper.ashx; Frank Stern and others, “New York Renewable Portfolio Standard Market Conditions Assessment” (New York: Summit Blue Consulting, 2009), available at http://www.nyserda.ny.gov/en/Program-Planning/Renewable-PortfolioStandard/~/media/Files/EDPPP/Energy%20and%20Environmental%20Markets/RPS/RPS%20Documents/market-conditions-final-report.ashx; Brandon Blossman, Becca Followill, and Jessica Chipman, “Texas Wind Generation” (Houston: Tudor Pickering Holt & Co., 2009), available at http://www.tudorpickering.com/Websites/tudorpickering/Images/Reports%20Archives/TPH.Texas.Wind.Generation.Report.August.2009.pdf.

22. The discussion here admittedly simplifies what are highly dynamic and fluid electricity marketplaces across the country. However, the fundamental point regarding lower cost and cleaner resources still applies.

23. This example and Figure ___ is adapted from “Wind Power Helps to Lower Electricity Prices,” Richard W. Caperton October 10, 2012, Center for American Progress. http://www.americanprogress.org/issues/green/report/2012/10/10/41100/wind-power-helps-to-lower-electricity-prices/

24. Id.

25. See, e.g., discussion of “Wind Energy Displaces Emissions from Fossil Fuel-Fired Power Plants,” in “Wind Energy and Air Emission Reduction Benefits: A Primer,” D. Jacobson D.J. Consulting LLC McLean, Virginia, C. High Resource Systems Group Inc. White River Junction, Vermont Subcontract Report NREL/SR-500-42616, February 2008 file:///E:/Downloads/wind-energy-air-emssion-reduction-benefits.pdf, at note 8 citing to an interview with Karl Pfirrmann, Interim President and CEO of PJM Interconnection, PJM and Wind, E-Cubed Publication of Penn Future, December 5, 2007.

26. Other resources in building block three but not discussed here include new and preserved nuclear power plants, and uprates at existing nuclear power plants.

27. Database of State Incentives for Renewables and Efficiency, March 2013, accessed on May 23, 2014, http://ww.dsireusa.org.

28. Map based upon information from the Database of State Incentives for Renewables & Efficiency. Available at: http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf.

29. RECs typically represent one MWh of the attributes of a renewable resource. Tracking systems separate the attributes embodied in a REC from the underlying MWh of electric energy, allowing the attribute and energy to be sold separately. “What is a Renewable Energy Certificate?” Center for Resource Solutions, http://vimeo.com/113250210.

30. See, “The Legal Basis of Renewable Energy Certificates,” Todd Jones, Center for Resource Solutions (2014). Available online at: http://www.resource-solutions.org/pub_pdfs/The%20Legal%20Basis%20for%20RECs.pdf. Also see our comments to EPA: http://www.resource solutions.org/pub_pdfs/CenterforResourceSolutions_Comments_DocketID_EPA-HQ-OAR-2013-0602_12-1-2014.pdf (The Legal Basis of Renewable Energy Certificates 2014).

31. For a closer look at various state deliverability rules, see “Threading the Constitutional Needle with Care: The Commerce Clause Threat to the New Infrastructure of Renewable Power,” Steven Ferrey, Suffolk University Law School, 2012, Texas Journal of Oil, Gas, and Energy Law, Vol. 7, p. 59, 2012, Suffolk University Law School Research Paper No. 12-46. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2166508.

32. OR. REV. STAT. Section 469A.135(1)(b) (2009).

33. While deliverability requirements are common, there are some states that do not impose that limitation and thus, all things being equal, could accept RECs from anywhere in the country, regardless of the ability of a renewables project to deliver energy to that state. For example, compliance with North Carolina’s RPS, for example, can be met partially (25 percent) through such RECs. N.C. GEN. STAT. Section 62-133.8(b)(2)(e) (2009).

34. “Tracking Renewable Energy for the U.S. EPA’s Clean Power Plan: Guidelines for States to Use Existing REC Tracking Systems to

Comply with 111(d), Robin Quarrier and David Farnsworth, Center for Resource Solutions and Regulatory Assistance Project, June 2014, www.resourcesolutions.org/pub_pdfs/Tracking%20Renewable%20Energy.pdf.

35. Id.

36. See "The Legal Basis of Renewable Energy Certificates," 2014; see also Hamrin, J. (2014) REC Definitions and Tracking Mechanisms used by State RPS Programs. Clean Energy States Alliance (CESA). Prepared for the State-Federal RPS Collaborative. Available online at: http://www.cesa.org/assets/2014-Files/RECs-Attribute-Definitions-Hamrin-June-2014.pdf.

37. Kan. Admin. Regs. § 82-17-1 (2013), available at http://www.kssos.org/other/Final_2013_KAR_Supplement.pdf.

38. June 2014 TSD at pages 5-6, Guidelines 79 FR 34918-34920 at page 34919.

39. Id. at page 34920.

40. June 2014 TSD at page 19.

41. Id. at 22.

42. For this discussion of avoided emissions, I am indebted to my colleague, John Shenot, who produced a thoughtful analysis of the most common methods for developing estimates of avoided emissions, and available databases and quantification tools for applying those methods associated with end-use energy efficiency in "Quantifying the Air Quality Impacts of Energy Efficiency Policies and Programs," August 2013, (Quantifying Air Quality Impacts); see Section 4"Methods and Tools for Assessing Emissions Reductions Attributable to EE," pages 26-35. file://rapvtdata/Shared/Users/dfarnsworth/My%20Documents/Downloads/RAP_Shenot_EEDataForAirRegulatorsFinal_2013_Aug_13.pdf

43. Id.

44. This was set in 2014, and is subject to several interim adjustments to the RGGI cap to account for banked CO_2 allowances. http://www.rggi.org/design/overview/cap

45. 2013 cap level and emissions from RGGI, Inc., at: http://rggi.org/

46. Note that, depending on how the state frames its program, RECs could be used for RPS compliance, as they are today, or for generator compliance to offset generator(s) emissions rate or both.

47. In order to establish a reasonable characterization of avoided CO_2 emissions characteristics of the REC, it is reasonable to assume that a CO_2 value based on avoided emissions methodologies described above and set out in Appendix Two would need to be established.

48. Two RECs (@1,000 lbs/MWh) chosen for easy translation, if necessary, to 1 CO_2 allowance, i.e., one ton of CO_2.

49. RGGI Comments at page 11. The RGGI states note that RE and EE displace "the state's or region's reliance on fossil fuel-fired generation." The RGGI states include the New England ISO, the New York ISO and two states from PJM.

50. Docket ID No. EPA-HQ-OAR-2013-0602 – RGGI States' Comments on Proposed Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 FR 34830 (June 18, 2014) (RGGI Comments) at page 11, http://www.rggi.org/docs/PressReleases/PR110714_CPP_Joint_Comments.pdf.

51. Id.

52. Id. at 10. While EPA has recognized this potential for double counting of benefits related to the RE and EE, in its Guidelines it indicates that this might be resolved by a cooperative agreement between the two states. Technical Support Document: State Plan Considerations, U.S. Environmental Protection Agency Office of Air and Radiation (June 2014), at 94. The RGGI states conditionally reject the suggestion "that a mass-based state could adjust the overall CO_2 emissions from the affected fleet to account for the 'export' of avoided CO_2 emission credits." RGGI Comments at page 11.

53. Id. As a response, the RGGI states recommend that "EPA prohibit rate-based states from taking credit for renewable generation that is already accounted for under the cap of a mass-based state, add that, despite their request, they would support "an alternative approach that avoids the double-counting issue" they articulated. Id.

54. This paper does not advocate for states to include voluntary renewable sales in their Clean Power Plan compliance portfolios. However, because the production of renewables can be expected to have effects on emissions included in state budgets, mass-based programs could consider a "mechanism" like the VRSA as one way to address the potential for this double counting issue.

55. Eight of the nine RGGI states have voluntary renewables "set-asides." See, "RGGI State Set-Aside Provisions for Voluntary Renewable Energy (VRE) DRAFT August 21, 2009," accessed January 2015. http://www.epa.gov/greenpower/documents/events/rggi_status_table.pdf

56. While the text discusses the RGGI set-aside process with a Vermont example, an approach developed through Public Service Board

orders, the State of Maryland's approach is included in the appendix because it is based on a rulemaking which could serve as a template to states considering the adoption of a set-aside mechanism.

57. "Order re implementation of the Regional Greenhouse Gas Initiative set-aside program for voluntary renewable purchases," Order of August 19, 2009; see also, Order of April 2, 2014, http://psb.vermont.gov/sites/psb/files/orders/2014/2014-04/ORDreAuctionProcedures%26SetAsideProgram.pdf.

58. The distinction here between a "policy" and a "mechanism" is intentional. RGGI's VRSA "policy" in which the states provide allowances in this limited context should not be confused with the potential use of a set-aside "mechanism" which might be part of a market-based approach involving the bundling of RECs with purchased carbon attributes.

59. See Appendix One—The Maryland Voluntary Renewable Set-aside Account.

60. EPA Fact Sheet: Clean Power Plan Flexibility, http://www2.epa.gov/carbon-pollution-standards/fact-sheet-clean-power-plan-flexibility

61. As noted, voluntary green power programs and related REC purchases, on the other hand, should not be included in state plans, as they are marketed as distinct from regulatory programs.

62. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," June 18, 2014, 79 FR 34918-34919, 34913.

63. The EPA has indicated that "An emission standard is non-duplicative with respect to an affected entity if it is not already incorporated in another state plan, except in instances where incorporated in another state as part of a multi-state plan." Guidelines 79 FR 34918-34919, 34913. The Guidelines provide an example of non-duplicative standard: an instance where "a state wished to take credit for CO_2 emissions avoided due to electric generation from a new wind farm, those avoided emissions could be considered non-duplicative and included for purposes of CAA section 111(d), even if electric generation from that wind farm was also being used to generate renewable energy certificates (RECs) to comply with the state's RPS requirements." Id.

64. Guidelines 79 FR 34918-34919, 34913.

65. See, http://www.dsd.state.md.us/comar/getfile.aspx?file=26.09.02.08.htm.

66. Id.

67. This is the approach taken by EPA's Emissions & Generation Resource Integrated Database (eGRID), which compiles emission rate data including greenhouse gases for 26 subregions of the U.S. Available at www.epa.gov/egrid/.

68. An actual marginal emissions rate as well as the timing for the production of renewable energy can be very time sensitive. EPA has noted that there is greater precision in a marginal emissions analysis to the degree the timing (e.g., hourly or daily) pattern of the supply of generation to the grid from a renewable resource can be known. See Quantifying Air Quality Impacts and the discussion of the "Statistical/Hourly Marginal Emissions Method" at page 31.

69. ISO-New England and the states served by that ISO have been leaders in developing marginal emissions methods. Their most recent marginal emissions analysis was completed in July 2013 and includes results for 2009 through 2011. A presentation on the most recent marginal emissions analysis is available at http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/eag/mtrls/2013/jul192013/meapp_071913_eag.pdf. EPA created and maintains an Avoided Emissions and geneRation Tool (AVERT) that can produce avoided emissions estimates based on a similar marginal emissions analysis for any region of the country. AVERT is available at: http://www.epa.gov/avert/.

70. Power sector analysts also use capacity expansion models to forecast what future resources could be added to the system to meet load that exceeds existing capacity. These models include dispatch features as well. Without getting into the details of how these models differ, this paper generically refers to either kind of model as a dispatch model.

71. Adapted from "Quantifying Air Quality Impacts," Table 3 at page 10.

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