Choosing a Policy Pathway for State 111(d) Plans to Meet State Objectives

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IN MID-SUMMER 2015, EPA is expected to issue its final "Clean Power Plan" regulations, which aim to reduce carbon dioxide emissions from existing fossil fuel-fired power plants under section 111(d) of the Clean Air Act. The final rule will require states to develop and submit state plans as early as mid-summer 2016, to achieve the federally prescribed state emissions goals.[1] Because EPA is expected to grant states broad flexibility in choosing a compliance pathway to achieve required emissions performance at existing power plants, states will need to evaluate the potential policy pathways and select an approach that best meets state objectives. This paper aims to assist states in choosing a policy pathway for their state 111(d) plans, guiding states through the key considerations and walking through potential policy pathways.[2]

A brief description of state obligations under EPA's Clean Power Plan is provided below, followed by a discussion of the key objectives states and their stakeholders are likely to consider in developing plans. Next, several threshold considerations for states are identified and briefly discussed, including the implications of rate-based versus mass-based approaches, and the role flexibility can play in a state's approach. Both mass-based and rate-based policy pathways are then discussed in light of likely state objectives. Following the paper's conclusion, brief step-by-step "straw men" are provided for each of the identified policy pathways to give policy makers and stakeholders a clearer sense of how each pathway might be implemented.

1 In its proposal, EPA indicates it will allow a one-year extension with a showing that the extension is needed, and a 2-year extension if the state is working toward a multi-state plan.

2 We use the term "111(d) plan" to distinguish the state plan called for by EPA's 111(d) regulations from state implementation plans required under section 110 of the Clean Air Act.

Coming Requirements for States

EPA's final regulations are expected to establish emissions goals for each state as well as the requirements that apply when states develop plans to achieve those emissions goals. The state goals are the minimum stringency that the state plan must achieve. The regulations will also provide states with guidance for designing and implementing required and some optional elements of state plans.

In its June 2014 proposal and related documents released for public comment, EPA signaled it will grant states broad flexibility to choose a policy pathway, provided that plan obligations are federally enforceable and that the state can demonstrate the plan will achieve the state goal within the prescribed timetable.[3] EPA also provided initial guidance on what measures could be counted toward achievement of a state goal, and how those measures might be counted.

A state goal can be applied in a rate-based form, meaning that the plan must not exceed a certain level of emissions per unit of power generated by covered power plants.[4] EPA is expected to issue state goals in the form of rates. Alternatively, a state plan can be designed to achieve the mass-based equivalent of the rate EPA prescribes, meaning that covered power plants do not exceed a certain aggregate emissions level in tons. States must decide whether to pursue a rate-based or mass-based approach as a threshold matter.

A state plan must meet the requirements of the final EPA guidelines to gain EPA's approval. If a plan submission does not meet the requirements and EPA does not approve the plan, the Clean Air Act provides that EPA must impose a federal plan for that state. To date, EPA has not indicated what a federal plan might entail, though the agency has indicated it will propose such a federal backstop for public comment.

Although states will not know the specifics of the final regulations until EPA releases them in mid-summer 2015, states can nevertheless begin understanding their policy options for 111(d) plans. To evaluate these options, it helps to first consider what are the state's objectives in designing and implementing a 111(d) plan, and then consider the available policy pathways in light of those objectives.

3 79 Fed. Reg. 34830 (June 18, 2014).

4 We refer to "covered power plants" throughout this paper because it is a commonly understood and used term outside of the air regulatory context. We note, however, that plant-level regulation is generally implemented on an electric generating unit basis. A single plant often has more than one unit, and a single plant can have multiple units that utilize different technologies and/or burn different fuels, and in some cases are subject to different air regulatory requirements. In the more detailed straw men (attached in the appendices) we refer to "electric generating units" rather than power plant or facility, because it is more precise.

Identifying State Objectives for 111(d) Plans

Given the broad flexibility afforded states to choose policy pathways for state plans, and because each pathway entails policy judgments that are likely to have different impacts on a state's electricity producers, distributors and consumers, it makes sense to first identify a state's objectives for its 111(d) plan. In discussions to date in various settings, states and their stakeholders have identified many of the following objectives for state 111(d) plans. Some of these objectives may not apply in an individual state and there may be other key objectives that an individual state and/or its stakeholders will identify in the process of considering the appropriate state plan. The idea is to identify the state objectives and to bear them in mind during development of the state 111(d) plan.

Cost-effectiveness

To be cost-effective a plan achieves the state emissions goal established by EPA at the lowest possible cost. In general, air pollution policies are most cost-effective when the policy allows regulated entities to access the lowest cost reductions, wherever they may be. Accessing lowest cost reductions, in turn, requires a flexible approach to regulation. Examples of such a flexible approach are programs that allow power plant owners to buy emissions reductions from others in the state or in other states.

Electricity system reliability

To preserve reliability a plan should avoid requiring actions that destabilize the system, such as requiring the shutdown of a specific power plant needed to maintain system reliability without allowing enough time to develop replacement generation or transmission. A plan approach that is more flexible in terms of how, where and/or when an emissions reduction goal is achieved will better avoid reliability impacts than a less flexible approach. Where an electricity system is managed across numerous states, such as through a regional independent system operator (ISO), then reliability may be best served extending flexibility across all or most of those states covered by the ISO. Thus, multi-state collaboration in 111(d) implementation may prove desirable for reliability purposes.

Achievement of the environmental goal with integrity

Achieving the environmental goal with integrity will require different measures on the part of the state depending on the approach selected. For example, achievement of a mass-based goal requires that emissions are accurately measured and tracked over time in order to assess whether the goal has been achieved. In a rate-based context, assessing compliance is likely to be more complex. Not only must generation information be gathered along with emissions information in a rate-based approach, but successful implementation of any crediting mechanism for energy

efficiency, renewables, and other creditable activities will depend on having credible information to calculate zero-carbon generation, megawatt hours of energy saved and/or avoided emissions attributable to the energy efficiency, renewables and other creditable measures.[5]

Given the broad flexibility states have, it makes sense to first identify the state's objectives.

Flexibility for regulated entities

Over several decades, policy makers have moved away from rigid approaches to reducing air pollution, especially when the environmental challenge can be met while also allowing regulated entities the flexibility to decide how and where to achieve emissions reductions.[6] EPA has recognized that the regulation of carbon dioxide emissions is an area where flexibility is particularly appropriate. The approaches under consideration by states and stakeholders differ in the amount of flexibility they offer regulated entities.

Regulatory certainty for regulated entities

Electricity sector investment decisions involve long time horizons and uncertainty makes those decisions riskier. The level of regulatory certainty varies in the approaches discussed by EPA in its proposal. For example, the state portfolio approach would entail reporting to EPA at scheduled milestones and implementing "corrective measures" if the state is not on track to meet its emissions goal. In contrast, a program that applies directly to power plants only and by design achieves the emissions goal without doubt greatly reduces such regulatory uncertainty.

Simplicity and ease of implementation

Some of the policy pathways are simpler and will be much easier to implement than others. Programs that are more complex may require more agency staff and a potentially greater budgetary investment in the agency and program infrastructure. Complexity can sometimes lead to higher costs for entities that must comply with the policy. On the other hand, sometimes more complexity is worth the cost when it is necessary to achieve other objectives.

Limiting federal involvement in state energy decisions and federal enforceability of existing state energy programs

Because energy planning has largely remained the purview of state elected leaders and policy makers, a number of states and their stakeholders have expressed a desire to retain state-level control over energy decisions wherever possible. Some policy pathways accomplish this goal better than others.

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5 In its proposal, EPA suggests that the emissions reductions from energy efficiency and renewable energy are important, but it seems to leave open the possibility that credits could be measured in megawatt hours rather than tons of emissions avoided. We agree that rate-based credits could take the form of megawatt hours, though there may need to be guidance on or standard provisions for how to incorporate MWh credits into a state or unit's adjusted emission rate for demonstrating compliance.

6 The recent example of the Mercury and Air Toxics Standards (MATS) rule for power plants stands in stark contrast, because that rule was aimed at reducing pollution impacts in specific locations and the Clean Air Act therefore does not provide for much flexibility in its implementation.

After deciding on the state's objectives, there are some key threshold questions for determining the direction a state goes.

For example, the state portfolio approach would require states to regulate entities other than the owners and operators of power plants, including entities engaged in implementing existing state energy policies. A number of approaches avoid this kind of federal involvement in traditionally state programs while still capturing the benefits of these existing state energy policies.

Maintain and/or enhance fuel diversity across all available resources

Different policy choices are likely to have different impacts on specific fuel and resource types. These impacts can be considered—especially in the context of analyzing the impacts of different approaches through energy economic modeling. Some states will seek to moderate impacts on existing coal plants, for example. Others may wish to avoid over-reliance on new natural gas plants, including potentially at the expense of existing natural gas units. Still others may wish to expand the share of renewable energy and/or energy efficiency serving customers.

Recognize unique state circumstances

States may have specific circumstances that warrant special attention when devising a state plan. Flexible approaches will allow regulated power plants more room to address special circumstances as compared to more rigid regulatory approaches.

Capture reductions from all activities

Policy approaches differ in the manner and extent to which they capture emissions reductions from specific activities. In a rate-based program, for example, reductions that occur outside of the power plants are only captured if they are formally evaluated and credited, such as crediting avoided generation due to energy efficiency. It also appears likely that some sources of reductions will not be creditable under a rate-based approach. For example, EPA has raised concerns about crediting Canadian hydropower, and plant retirements are not directly credited under a rate-based approach. Mass-based programs, in contrast, capture all reductions whatever their cause so long as the reductions show up at existing plants in the state.[7]

Preserve the option to connect with other states

States can preserve the option of allowing their regulated sources to seek lower-cost reductions in other states. Some policy approaches make that multi-state coordination easier than others, and some will require more collaboration across state lines to ensure compatibility than other approaches.

7 To the extent a state is a net-importer of electricity, some reductions or avoided emissions may show up at plants in another state. In addition, regional wholesale electricity markets dispatch plants across a multi-state area on an economic basis, meaning states do not control which plants are dispatched and power flows can change over time as a result of a number of factors. A regional or multi-state approach to 111(d) implementation will better address these interstate dynamics.

Trading approaches, for example, allow the transfer of allowed tons or credits from an entity in one state to an entity in another state.

Consistency with electricity system and wholesale power markets

States will want to understand how different approaches may interact with the electricity system and wholesale electricity markets to avoid negative or unintended impacts on the system. Mass-based approaches have a different impact on which plants are dispatched than rate-based approaches, for example. Whether a state regulates at the utility or generating unit level also may impact the way the program interacts with wholesale power markets. Regional or multi-state approaches can help avoid distortions that may occur when different states implement different approaches.

Whatever the final list of objectives may be for a specific state, it will be important to keep those objectives in mind when making threshold decisions and evaluating policy pathway options.

Threshold Considerations for Choosing a 111(d) Policy Pathway

In addition to understanding the objectives for a state plan, there are some key threshold questions for determining the direction a state goes in developing its plan. A number of these questions and related issues are outlined below. To better appreciate the ramifications of proceeding in one direction or another, it may be helpful to walk through the specific policy pathways in the "straw men" attached in the appendices.

Mass-based or rate-based approach?

A key threshold consideration for states in developing a state 111(d) plan is whether the plan will take a mass-based or rate-based approach. EPA is expected to issue state emissions goals in rate-based form, and to allow states the option of converting the rate-based goals into mass budgets. EPA has proposed in the June 2014 draft that states will be able to choose from a number of different approaches to convert rate to mass, or propose their own approach. Whether a state chooses a rate- or mass-based approach to implementation, the stringency of the program is supposed to be equivalent.[8]

The tables found in the following outside page margins compares and outlines some of the tradeoffs between mass- and rate-based approaches to assist in deciding between the two general approaches.

Comparing Mass- and Rate-based Approaches

	How does it work?
MASS-BASED	The state goal is expressed as a maximum number of tons of carbon dioxide that may be emitted by covered plants for each time period. As long as the covered plants emit at or less than that number, the state goal is achieved for that time period.
RATE-BASED	The state goal is expressed as a number of pounds of CO_2 per megawatt hour of generation from covered plants. As long as the covered plants produce electricity at or below the prescribed rate—after adjusting for energy efficiency, renewables and other allowed credit—the state goal is achieved.

	Emissions & Growth?
MASS-BASED	A mass-based approach constrains overall emissions leading at least in theory to a certain environmental outcome. Because the rate-to-mass conversion may take growth through 2030 into account, a mass-based approach can also allow for load growth and even increased emissions. In addition, the proposal does not require new sources to be covered by the mass emission limit—although there are good reasons why a state will want to include them. Some have also suggested a mass budget could be adjusted up or down in the future if load growth assumptions prove wrong.
RATE-BASED	A rate-based approach does not constrain overall emissions, and so in theory this approach could lead to an increase in emissions. A rate-based approach allows for load growth.

8 79 Fed. Reg. 34830, at p. 34837.

How are emissions reductions captured?

MASS-BASED

A mass-based approach captures all emissions reductions that occur at the covered plants, whatever the reason for those reductions, without the need to design and implement a crediting mechanism for those reductions. Importantly, reductions can be captured from activities or events that EPA or a state might not allow a state to credit in the rate-based context, or that may be difficult to credit.

RATE-BASED

In order to credit emissions reductions or avoided emissions that result from activities outside the fence line of power plants—such as through energy efficiency or renewable energy projects—a state must design and implement a crediting mechanism for each type of credit. This is the biggest administrative challenge in the rate-based context that does not exist in the mass-based. Some eventualities that reduce emissions may not affect the emissions rate, such as plant retirements or when demand is reduced for reasons that cannot be credited. In addition, some have raised concerns that credits and the crediting process can be legally challenged, including through citizen suit actions.

Who will have enforceable obligations under the state plan?

Another key question in the design of the plan approach will be who has an enforceable regulatory obligation under the chosen approach.[9] Potential regulated parties can be separated into two groups: (a) owners and operators of covered power plants; and (b) other entities.

- **Owners and operators of covered power plants.** Under EPA's June 2014 proposal, every state plan must impose some enforceable obligation on the covered power plants. This obligation could be imposed at either the facility or electric generating unit level, or at the utility or fleet level. Examples of approaches that focus on the two levels are described in greater detail below.

- **Should a state impose enforceable obligations on other entities to carry out enforceable measures in its state plan?** In its June 2014 proposal, EPA proposes to allow states to impose federally enforceable obligations on entities other than the owners and operators of the covered plants as part of what EPA calls a state "portfolio approach".[10] For example, a state plan could impose federally enforceable obligations on the administrator of an energy efficiency program to deliver a certain amount of emissions reductions or megawatt hours of energy savings. In such a case, a portion of the state goal would be achieved through enforceable obligations on the covered power plants, and the remainder of the obligations on one or more other entities.[11] In many states it may be necessary for environmental agencies to obtain new legislative authority to impose air regulatory obligations on entities other than the emitting facilities.

  As an alternative to the state portfolio approach, EPA requested comment on the "state commitment approach" in which the state would assume responsibility for achieving a portion of the state goal without the need to impose enforceable obligations on entities other than the affected power plants.[12] In a response to this request, a group of states requested that EPA allow the state commitment approach provided that it is accompanied by a backstop program that would achieve the emissions goal in the event the state does not meet its commitment by a certain milestone. If EPA were

9 Here it is important to recognize that the state's obligation is to develop a new regulatory policy—in the form of a 111(d) plan—that achieves the state goal, not to achieve the goal itself. If the state does not meet this obligation, EPA steps in to impose a federal backstop plan that is designed to achieve the state goal. The Clean Air Act does not impose the reduction obligation on the state, but rather on the covered power plants. States have the opportunity to regulate, but can decline and let EPA step in.

10 79 Fed. Reg. 34830, at p. 34837.

11 We note that there has been some legal push back on the notion that a state or EPA could enforce 111(d) obligations against entities other than the owners and operators of covered power plants based on concerns that the Clean Air Act does not contemplate enforceable obligations on these other entities. Aside from these legal concerns, states and stakeholders have voiced concern over subjecting other energy-related entities to EPA enforcement. We note that there are other options that apply only to the power plants themselves that capture energy efficiency and renewables without the need to subject other entities to regulation. We outline several of those options in this paper.

12 79 Fed. Reg. 34830, at p. 34902.

to allow this suggested approach, a state would need to develop a plan designed to achieve the state commitment, and also develop a backstop mechanism that would kick in if the state's commitment is not met.

How much flexibility will states allow regulated entities to have for compliance?

In general, giving regulated parties flexibility will permit them to seek lower cost reductions. It can also permit regulated parties to operate plants that are needed for reliability. Three types of regulatory flexibility are reflected in the approaches outlined below: utility or fleet level "bubbling", trading across plants or utilities, and optional trading.

- **Utility or fleet-level "bubbling"?** Applying the obligations to the utility (or other fleet-level entity) is a limited approach to flexibility that allows utilities and other plant-owning entities to apply the emissions budget or the prescribed emissions rate to the utility's entire fleet of plants. It would not allow trading of unused tons or credits to other utilities or entities, but would essentially allow a kind of trading among the utility's plants by assessing the performance of the entire utility fleet against the emissions goal. In a rate-based approach, an average emission rate is applied to a utility's fleet, with adjustments for avoided generation, and in a mass-based approach the utility's fleet remains within an emissions budget.
- **Trading across plants or utilities?** More expansive flexibility would allow plant owners to pursue a wider range of low-cost emissions reductions or zero-emission megawatt hours. This can most easily be accomplished by allowing full trading of allowed tons or credits. Full trading among all emitting power plants has long been considered the most cost-effective approach to reducing air emissions. Full trading is also more likely to provide owners with the flexibility to operate plants that are needed for reliability purposes.
- **Delegate decision on whether to trade to utilities (or other plant-owning entities)?** Rather than set up a system of full trading among power plants, a state could delegate the decision whether to participate in trading to the utilities and other plant-owning entities. Under this approach, the state takes either a rate-based or mass-based approach. A utility could choose to manage its prescribed emissions budget or prescribed emissions rate solely across its fleet, or it could opt into a voluntary trading infrastructure that would enable the utility to sell or buy allowed tons (allowances) or credits. In theory, this approach should provide many or all of the benefits of the full trading approach because utilities can be expected to trade when it adds needed flexibility and/or presents cost benefits.[13]

	Will allowed tons or credits be available to use for compliance?
MASS-BASED	Allowed tons are available up front on day 1 for use by regulated power plants as part of the state's emissions budget. This provides up-front certainty to covered plants that allowed tons will be available for compliance.
RATE-BASED	Credits are issued by the state through a crediting mechanism. In states where existing natural gas units perform below the goal, they generate credits for each hour of operation. The issuance of many credits, however, depends on the applications of those who carry out projects, such as energy efficiency measures. Credit supply is therefore uncertain as compared to a mass-based approach. Uncertainty can be managed by promoting activities that earn credits through a clear and efficient crediting mechanism that is deployed at the start of the program.

Allowing regulated entities to use tons or credits that originate in another state is another form of flexibility.

13 Utilities may be in a position up front to say whether full trading will be most cost-effective and meet other state objectives, in which case the state could decide to implement full trading up front.

How is the level of effort allocated across entities?	
MASS-BASED	The state must allocate or otherwise distribute its emissions budget, i.e. the allowed tons a state's plants may emit in a given year, for use by power plants. Allowed tons have value and states can allocate or distribute that value to achieve specific ends. Allocation or distribution decisions can be challenging, but also represent an opportunity to address impacts or achieve complementary goals.
RATE-BASED	The state can apply the EPA-prescribed rate to every portfolio or power plant, or the state can prescribe different rates to different portfolios or types of plants so long as the state overall meets the EPA-prescribed state goal. Differentiating rates by portfolio or plant type introduces complexity and may require corrective measures in the event the approach does not achieve the overall EPA-prescribed state emissions rate goal, but it does provide a way to allocate effort differently for different portfolios or plants. Credits benefit the producer of the credit.

All three types of flexibility are reflected in the approaches outlined below and in the appendices.

Will the state plan allow for coordination across state lines?

Allowing regulated entities to use tons or credits that originate in another state is another form of flexibility that states may wish to provide in their state plans.[14] This can be accomplished in either mass-based or rate-based programs, though connecting rate-based systems may prove more difficult than connecting mass-based systems because of the greater potential for differences in the way that credits are generated in different rate-based states.[15] At a minimum, because rate-based programs require fairly elaborate mechanisms for crediting various types of energy efficiency, renewables and other activities, states considering connecting rate-based programs should expect that considerable coordination among states would be required. Mass-based programs, in contrast, require faith in the integrity of the emissions budget and emissions accounting in the other state(s) so that one state's ton is the same as another state's ton. This may require less coordination for states because EPA will approve the mass-based budgets for each state and the emissions are already measured, monitored and reported under federal regulations.

What are the available state plan approaches?

State portfolio approach: a combination of direct limits on plants, plus federally enforceable obligations on other entities.

Under a state portfolio approach, a state implements more than one emissions reduction policy and divides the state's prescribed emissions goal among the policies. In the process, the state imposes federally enforceable obligations not only on the owners and operators of covered power plants, which EPA has said must be regulated, but also on one or more other entities responsible for achieving part of the state's goal. For example, in a state where energy efficiency programs are administered by an independent entity rather than the utilities themselves, the state could require the energy efficiency program to deliver a portion of the emission reductions, leaving the remainder to the program that applies to the

14 In its June 2014 proposal, EPA suggested that states seeking the extra two-year extension of time for multi-state plans would need to commit to file a single multi-state plan rather than separate individual plans that contemplate collaboration or linking. However, stakeholders have asked EPA to allow states to submit individual states plans that allow for multi-state efforts, such as linking compatible trading systems, and allow those states access to a two-year extension for submittal.

15 State energy efficiency programs differ in the scope of the measures they support, the methodologies for measuring and verifying energy savings, whether they are utility-focused or otherwise implemented. In addition, some states may wish to capture energy efficiency carried out by private entities under performance contracts. Differences across states can be reconciled, but that reconciliation adds a challenge to multi-state collaboration that is not present in the mass-based context.

power plants themselves.[16] In general, states have not expressed much interest in the state portfolio approach because of the need to subject other state or private entities to federal enforcement, and because the same policy objectives can be accomplished more effectively through the many approaches that apply directly to the power plants themselves. As a result, this paper does not present a detailed straw man for the state portfolio approach.[17]

Utility or entity-level approaches.

Many state electricity programs are focused on the utility, and this has led some to suggest that the 111(d) plan could also effectively focus on the utility. Applying either a rate- or mass-based policy to the utility affords some limited flexibility that can reduce costs and improve reliability—especially for utilities that have a large number of power plants in their fleets and have other options for reducing emissions, including renewable electricity and energy efficiency programs. These utility approaches present a challenge for the smaller utility (or non-utility plant owner) that has fewer plants to work with and may not be in a position to implement large energy efficiency programs.[18] Three variations on the utility approach are discussed briefly below and are described in greater detail in the appendices.

- **Mass-based utility approach.** Under a mass-based utility approach, the state allocates shares of its annual emissions budget to each utility. The utility then manages that emissions budget across its fleet of power plants. As long as the utility remains at or under budget for each time period, the utility and all of its power plants are in compliance with the program. As long as all utilities in the state are in compliance, then the state's mass-based goal will be achieved. A straw man for this approach is provided in appendix A-1.
- **Rate-based utility approach.** Under a rate-based utility approach, the state requires that each utility (or other plant-owning entity) achieve the prescribed state emissions rate on average, across its fleet of power

	What is the impact on multi-state coordination?
MASS-BASED	Multi-state coordination will be easier in a mass-based context for several reasons: mass-based states can be linked at any time so long as each state has faith in the integrity of the tons from the other states and EPA has approved the state's budget; and mass-based goals do not have to be averaged when states decide to link because they are additive. If a mass-based state goal is treated as a budget of allowed tons, or allowances, each allowance represents the authorization to emit one ton of CO_2; "a ton is a ton" regardless of the state of issuance. This means each state can keep its mass-based goal and trade with other states that do the same.
RATE-BASED	Multi-state coordination faces greater hurdles for rate-based approaches because EPA proposes that states must first average their rates together to arrive at a single rate for all connected states. This is because where there are differences between state rate-based goals: (a) a credit from one state is not the same as a credit from the other state; (b) trading credits seems to amplify the competitive disadvantage posed for the state with the more stringent rate; and (c) trading leads to shifts in generation that potentially undermine achievement of the environmental goal. Yet the requirement to merge state goals means some states will have to adopt a more stringent rate when collaborating with other states—a significant political challenge. If in the final rule EPA allows states with different rates to trade rate-based credits, additional work is needed to identify ways to counteract competitiveness and leakage effects to make that approach workable for states.

16 It is important to understand that this approach is not necessary to capture all of the benefits of a state's energy efficiency, renewables and other programs. Indeed, mass-based approaches that apply solely to regulated power plants automatically capture reductions from all activities, and rate-based programs that apply solely to regulated power plants can be designed to credit these activities while avoiding the need to impose obligations on entities other than the plants themselves.

17 As mentioned above, EPA requested comment on and a number of states requested the option to pursue a "state commitment approach" where the state assumes the commitment and identifies the measures it will undertake to achieve the state emissions goal. The measures themselves would not be federally enforceable until and unless it was clear the states' measures failed to achieve the result, in which case a federally enforceable backstop mechanism would kick in on affected power plants that would achieve the state goal with certainty. This approach would essentially require a state to develop two plans: one set of measures for which the state commits results, and a comprehensive backstop mechanism that kicks in if the state's measures are unsuccessful.

18 Some reviewers of the draft paper consider this size issue such a big drawback of a utility-focused approach as to render the utility options undesirable for most states. Those reviewers argued that states should try to give smaller entities the same compliance flexibility that is given to bigger entities. This tends to support plant- or unit-level trading where smaller entities can use allowed tons or credits from others toward compliance.

How do new plants factor in?	
MASS-BASED	EPA proposed that states have the option of covering new plants. States that cover new plants may add the emissions from the new plants into their emissions budgets and avoid creating an uneven playing field between new and existing plants.
RATE-BASED	EPA proposed that states have the option of covering new plants. States that include new plants may find it easier to comply with the state's emissions rate goal, because new plants in many states generate at a rate below the prescribed state rate.
What is the economic effect?	
MASS-BASED	A mass-based approach places value on avoided tons of carbon dioxide and increases the relative cost of generating from higher emitting sources compared to lower emitting sources. This effective carbon price on each ton of carbon dioxide emitted by covered plants serves as the economic incentive for plant-level emissions reductions, dispatch changes, energy efficiency, or other emissions reduction measures that reduce total CO_2 emissions within the state.
RATE-BASED	A rate-based approach does two things: it effectively imposes a carbon price on plants that generate electricity at a rate higher than the prescribed rate, while also providing a subsidy (a payment) to generators that operate below the prescribed rate. This has the effect of subsidizing generation that emits below the emission performance standard while discouraging generation that emits above the standard.

plants.[19] Depending on the stringency of the state goal, it may be possible for utilities to meet the emissions rate by changing dispatch on the utility's system, co-firing lower carbon fuels or fuel switching, and through heat rate improvements. In many states, however, utilities will be unable to meet the rate without also claiming adjustments for avoided emissions that are the result of energy efficiency, renewable electricity and other creditable activities. EPA and/or states implementing this or any rate-based approach must develop protocols and mechanisms for adjusting the rates to reflect energy efficiency, renewables and other credited activities, a task that presents a significant challenge under all rate-based approaches.[20] A straw man for this approach is provided in appendix B-1.

- **Utility approach with optional trading.** Whether a state takes a mass-based or rate-based approach to achieving its emissions goal, it could allow utilities to opt into a trading program. Trading would allow utilities with excess emissions reductions or credits to sell them to other utilities in the state, or possibly in other states.[21] Where a utility can purchase reductions from another utility at a lower cost than achieving the same result on its system, trading would provide that flexibility and benefit the utility's customers. Importantly, optional trading would provide small utilities such as cooperatives and municipal electricity generators access to reductions they might otherwise lack. Straw men are contained in appendix A-3 for a mass-based approach and appendix B-3 for the rate-based approach.

Plant- or unit-level approaches with trading.

- **Mass-based trading or emissions budget trading.** In a mass-based trading program, also called an emissions budget trading program, a state starts with its allowed emissions budget—the total number of tons that may be emitted from covered power plants in the state. The budget is derived by converting the EPA-prescribed emissions rate goal to an equivalent mass-based budget. The state then issues one "allowance" for every ton in its emissions budget and distributes those allowances. Each allowance can be used by a power plant to emit one ton of carbon dioxide. Each power plant measures, monitors and reports its carbon dioxide emissions to the state. At the end of each compliance period (typically 1 to 3 years) the plant must turn in enough emissions allowances to cover its emissions. Because the allowances are freely transferable, excess allowances can

19 We note above that a state could in theory prescribe different rates to different utilities in the state so long as the state ultimately achieves the EPA-prescribed state rate. Applying different rates to different utilities would substantially increase the complexity of the program and make achievement of the goal uncertain.

20 To illustrate this complexity, consider that state energy efficiency programs can involve more than a hundred different sub-programs targeting specific energy consuming activities, structures, appliances and equipment, each sub-program with its own requirements. These issues are all solvable with time and effort, but states considering the rate-based approach will want to understand the magnitude of the challenges before proceeding.

21 We note that, under EPA's June 2014 proposal, trading across state lines in a rate-based approach would require that the two states average their prescribed emissions rate goals together so that both states have the same prescribed emissions rate goal, a precondition that may make interstate trading in a rate-based context much less likely.

be sold to other plant owners who need them. The infrastructure for mass-based trading has been developed for other air pollutants and could fairly easily be adapted to carbon dioxide. EPA has helped states develop such infrastructure for other programs and could be enlisted to provide assistance for this program. A straw man for implementation of this approach is described in appendix A-2.

- **Rate-based trading.** Trading can also occur at the plant level using a rate-based approach. A rate-based trading program would apply the state's EPA-prescribed rate-based emissions goal. The state would then allow each plant to either (a) earn credits for power produced at better than the prescribed emissions rate performance standard; or (b) use credits acquired to adjust the plant's emissions rate so that at the end of the compliance period the plant's emissions rate meets the prescribed emissions rate. In addition to credits earned by plants that operate below the prescribed rate, a state may issue credits upon application from energy efficiency project proponents or renewable energy purchasers who show that the energy efficiency or renewable energy avoided a certain amount of emissions from covered plants.[22] Credit trading allows even very carbon-intensive plants to meet the rate and operate as long as the plant can acquire credits sufficient to adjust the emissions rate to the prescribed emission rate. A straw man for this approach is detailed in appendix B-2.

Multi-state approaches.

- **Utility or entity-level coordination across state lines.** Because some utilities operate in more than one state, it is likely that these utilities could most cost-effectively access emission reduction opportunities if they were allowed to move tons, in the form of credits or allowed tons from one state to another state. In other words, a multi-state utility would be permitted to manage its portfolio flexibly across multiple states to achieve its share of the emissions reduction obligations in all of the states where the utility operates. The states where the multi-state utility operates would have to agree to allow the utility to move the credits or allowed tons that originate in one state across state lines for use in the other state. For such a multi-state utility approach to work, any states choosing to be involved would have to take either a mass-based or a rate-based approach for consistency, because transferring tons from a rate-based state to a mass-based state is not workable. In addition, in order for a multi-state utility to use a rate-based utility approach across two or more states, the involved states must agree to a combined generation-weighted average emission rate goal, as provided in

	How does the approach affect competitive electricity markets?
MASS-BASED	Under a mass-based approach in a competitive wholesale electricity market, fossil units have a new operating cost that gets added to their bids. The cost is tied to the carbon emissions, so that units with greater emissions per unit of power produced will have a higher cost. The carbon price changes the order that units are dispatched. A multi-state or regional market-based trading approach results in a consistent carbon price signal that affects units in the region uniformly; whereas a state-by-state carbon price means units of the same type in different states may be affected differently.
RATE-BASED	Under a rate-based approach in a competitive wholesale electricity market, fossil units that operate below the prescribed rate will earn a subsidy that decreases the units' operating cost and the amount of their bids to the ISO/RTO. Other units have to obtain credit(s) at a cost, thereby increasing their operating costs and the size of their bids to the ISO/RTO. In this way, rate-based approaches move some units up and push other units back in the dispatch order. A regional emissions rate approach places all units in the region on a level playing field (with a uniform credit price), while state-by-state implementation or different state rates means uneven competition.

22 We assume a state would establish a "credits desk" that would receive applications from energy efficiency project proponents and renewable energy purchasers with supporting documentation to support the state's issuance of credits. Legal experts have pointed out that the issuance of credits could be challenged on a case-by-case basis, including through citizen suits under the Clean Air Act—a prospect that makes rate-based credit trading less attractive to some.

Multi-state collaboration is most easily accomplished between mass-based states that take the same or similar trading approaches.

EPA's June 2014 proposal. For this reason, a mass-based approach is more amenable to multi-state utility level coordination.

- **Mass-based unit-level trading across state lines.** Multi-state collaboration is most easily accomplished between mass-based states that take the same or similar trading approaches. In its simplest form, each state allows its power plant owners to use the allowed tons, or allowances, that originate in the other state and prescribe rules and/or a transfer mechanism to effectuate the transfer of those allowances between the states and between the two plant owners.

  A primary concern for a state that wishes to permit its power plant owners to use allowances from another state is whether the allowance from the other state is as "good" as an in-state allowance. Power plants in all states currently measure, monitor and report their emissions pursuant to the same federal requirements, meaning accounting for emissions is identical in all states.[23] Creation of the allowances in a mass-based program is a straightforward exercise: each allowance represents one of the allowed tons under the state's EPA-approved emissions budget. As long as a state does not issue allowances in excess of its EPA-approved emissions budget and enforces current emissions measurement, monitoring and reporting requirements, other states should rest assured that an allowance from the state is a good ton. In such a circumstance, mass-based trading between plants in two or more states is simple and straightforward.

23 40 CFR Part 75.

- **Rate-based unit-level trading across state lines.** Rate-based trading across states is similar to multi-state collaboration in a mass-based context, but it raises additional issues. First, EPA's June 2014 proposal requires rate-based states to average their emissions rates together in order to allow interstate trading because differing rates across states lead to shifts in generation that can undermine achievement of the environmental goal. Because a credit represents the difference between actual performance and the state goal rate, where there are differences between state goals, a credit in one state is not the same as a credit in another. The requirement to merge state goals means some states will have to adopt a more stringent rate when collaborating with other states—a significant political challenge. Even if averaging of state goals were not required by EPA, differences in rates across states lead to different subsidies for credit-producing activities (including natural gas generation), uneven competition and emissions leakage that may make trading unappealing to states because it would seem to amplify these effects.[24] Additional work is needed to identify ways to counteract these effects.

  Second, in the rate-based context, states are likely to credit different activities or credit the same activities in different ways. The potential for these differences raises potential challenges for the state considering allowing its power plants to use credits from another state. Indeed, the actions of one state have a direct impact on the value of the credits in the other state. For example, there are significant differences across state energy efficiency programs that will mean crediting for energy efficiency across states will also be different. A state may have an energy efficiency program that is broader in scope than its neighbor, for example. Or the two states may measure energy savings differently for the project types they do have in common. A key question for each state in this circumstance is whether they will allow the credit from the other state even though the other state uses a different methodology for issuing the credit. An alternative approach would involve the states seeking to harmonize the differences in their programs.[25]

Rate-based trading across states is similar to multi-state collaboration in a mass-based context, but it raises additional issues.

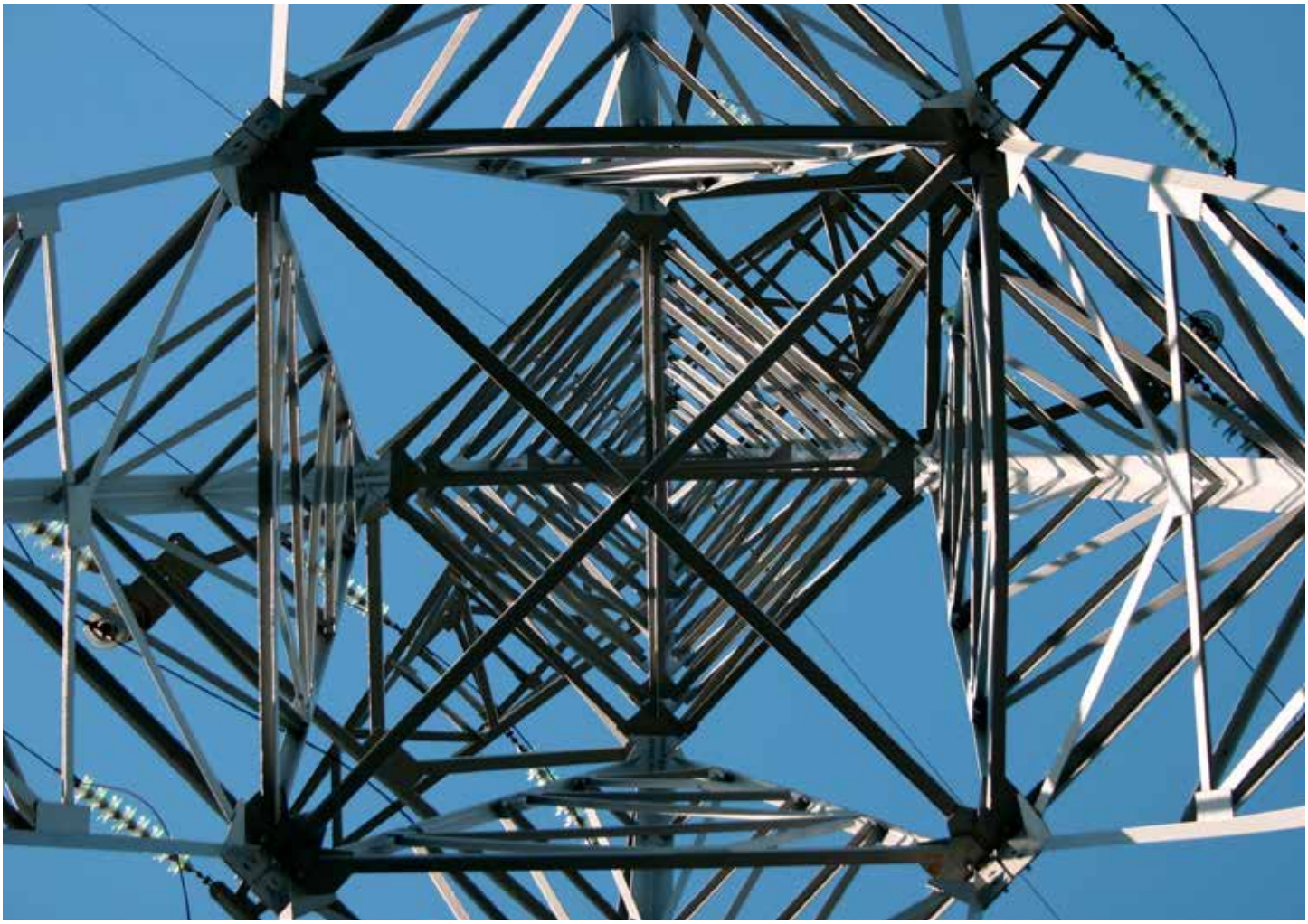
24 Consider two states with two different EPA-prescribed rates, each with an identical natural gas combined cycle power plant (as well as other generation). In the absence of trading between the two states, the gas plant in the state with the less stringent EPA-prescribed rate will earn more credit and run more than the identical plant in the other state with a more stringent rate. Without trading between the states, the subsidy for the plant in the state with the less stringent rate will be limited to what is required to bring that state into compliance. If the states were to introduce credit trading between them without averaging state goals, the credit price in the less stringent state will increase, further subsidizing the natural gas plant in the less stringent state and shifting generation away from the natural gas plant in the more stringent state. In addition to increasing the competitive disadvantage of the natural gas plant in the more stringent state, trading between two states with different rate-based goals would seem to undermine the environmental results. This dynamic demands much additional thought and analysis.

25 One reviewer suggested that states might not worry about the differences in rate-based crediting in another state as long as EPA approves the crediting in that state. This may be the case if EPA seeks to create a level playing field across states in the way it approves crediting mechanisms. To the extent EPA allows differences across states, however, those differences present potential obstacles to interstate trading.

A review of the different approaches suggests that several offer flexibility to regulated sources and may allow for cost-effective reductions.

Conclusion

States are now beginning to evaluate their options for designing and implementing a 111(d) plan. Once a state defines its plan objectives, there are threshold decisions to make concerning whether a state will use a mass-based or rate-based approach, and how much flexibility it will afford regulated entities. A review of the different approaches suggests that several offer flexibility to regulated sources and may allow for cost-effective reductions. Mass-based approaches may present fewer implementation challenges on both an individual and multi-state basis because they capture emission reductions without the need to develop cumbersome crediting mechanisms and coordinate the design of those mechanisms across states. In addition, because rate-based approaches create a generation subsidy and do not limit total emissions, multi-state coordination under rate-based approaches would likely face additional challenges to ensure integrity and achieve agreement across two or more states.



Comparing Mass- and Rate-based Approaches with Varying Levels of Flexibility

MASS-BASED APPROACHES			RATE-BASED APPROACHES		
Utility Budget	**Full Budget Trading at Unit Level**	**Utility Budget w/ Optional Trading**	**Utility Rate**	**Full Rate-based Trading at Unit Level**	**Utility Rate w/ Optional Trading**
How is the EPA-goal applied and to whom?					
The rate-based state goal is converted to an equivalent mass goal or emissions budget. State allocates share of state emissions budget to each utility or other unit-owning entity.	The rate-based state goal is converted to an equivalent mass goal or emissions budget. State issues allowances, one for each ton in the state emissions budget.	Same as Utility Budget, except state allows utility or other entity to opt into trading to provide another way of managing its obligation. State issues allowances and utility submits one allowance to cover each ton emitted in the compliance period.	State applies the EPA-prescribed state rate to each Utility. State either provides a mechanism—a credits desk—for issuing utilities credit for certain measures, such as EE and RE, or the state prescribes other method for adjusting utilities' rates.	State applies the EPA-prescribed rate to each electric generation unit. State provides a mechanism—a credits desk—for issuing credit for creditable measures such as EE and RE. State issues credits automatically to fossil units that generate at below the prescribed rate.	Same as Utility Rate, except a credits desk for issuing credits is clearly the best option.
What does the regulated entity have to do?					
Measure, monitor and report its CO_2 emissions from all of the entity's covered units; Submit a compliance statement at the end of the compliance period demonstrating that the entire portfolio remained within emissions budget.	Measure, monitor and report its CO2 emissions from all of the entity's covered units; Each unit must submit one allowance for each ton of CO_2 emitted in the compliance period. Entities can use allowances acquired from other entities to demonstrate compliance.	Measure, monitor and report its CO_2 emissions from all of the entity's covered units; Entities that have not opted into trading file a compliance statement at the end of the compliance period demonstrating that the entire portfolio remained within emissions budget; and Entities that opt into trading must submit one allowance for each ton of CO_2 emitted in the compliance period on a unit-by-unit basis.	Measure, monitor and report its CO_2 emissions and generation from all of the entity's covered units; The entity submits a compliance statement at the end of each compliance period to demonstrate that it meets the prescribed rate across its portfolio, after adjusting for creditable activities. Utility can adjust its rate with credits issued by the state or otherwise in accordance with state-established methods for adjusting rate for creditable activities.	Measure, monitor and report its CO_2 emissions and generation from all of the entity's covered units; Each unit must either demonstrate that it *actually* met the prescribed emissions rate or submit enough credits to allow its actual emissions rate to be *adjusted* to meet the prescribed emissions rate. Units that generate below the rate earn credits.	Measure, monitor and report its CO_2 emissions and generation from all of the entity's covered units; Entities that choose to manage the rate across their portfolio without trading submits a compliance statement at the end of each compliance period to demonstrate that they meet the prescribed rate across a utility portfolio, after adjusting for creditable activities; Entities that opt into trading can use credits purchased from other entities to demonstrate compliance.

MASS-BASED APPROACHES			RATE-BASED APPROACHES		
Utility Budget	**Full Budget Trading at Unit Level**	**Utility Budget w/ Optional Trading**	**Utility Rate**	**Full Rate-based Trading at Unit Level**	**Utility Rate w/ Optional Trading**
Does the Approach Lend Itself to Multistate Collaboration?					
Where a utility operates in more than one state, as long as all of the participating states undertake a mass-based approach, the state plans could provide for the movement of tons within the utility's portfolio from one state to another. The state plans of any involved states would have to recognize and allow for such an interstate transfer and include procedures to avoid double counting.	Collaboration between states straightforward: each state would allow its units to use allowances from another state for compliance purposes; acceptance of allowances could occur at any time; coordination limited to emissions and allowance tracking.	When trading is optional, two or more states could collaborate as described under Utility Budget or under Full Budget Trading, or both. With trading, there is a need for a tracking system. Entities that opt into trading can use allowances acquired from other entities.	Where a utility operates in more than one state, in order for the utility to manage its portfolio across multiple states all of the states would have to average their emissions rate goals to arrive at one multi-state goal. Then the states would have to permit the averaging of the utility's adjusted emissions rate across the utility's portfolio irrespective of state boundaries.	Full Rate-Based Trading between states requires the states to first average their state emission rates to arrive at one multi-state goal. Then each state would allow their units to use credits from the other state(s) for compliance purposes. An emissions, generation, and credit tracking system would be necessary.	When trading is optional in the rate-based context, the states that wish to "link" must first average their emissions rate goals to arrive at one multi-state goal. Linking two states could then take the form of the approach described under Utility Rate or the approach described under Full Rate-Based Trading, or both. With trading, there is a need for a tracking system.
Benefits of the Approach					
Fairly straightforward to administer for the state. Good for larger utilities that have options on their systems. CO_2 emissions are already measured, monitored and reported.	Most likely to result in least-cost outcome and facilitate system reliability. Well-established approach in use for SO_2, NO_x and CO_2. CO_2 emissions are already measured, monitored and reported. Allowances have value and that value can be used to accomplish specific ends. Allows for smooth interaction with wholesale electricity markets because allowance price is simply added to the generator's bid. Easily implemented across states.	Can provide many or all of the benefits of Full Budget Trading while leaving the decision whether to trade up to the utility or other unit-owning entity.	The utility rate approach allows limited flexibility for utilities to manage their emissions rates across all of their affected units.	Most likely to result in least-cost outcome among the rate-based approaches because it allows units to find lowest cost credits. A consistent credit price and a single multi-state rate-based standard allows for smooth interaction with wholesale electricity markets because credit price is simply subtracted or added to the generator's bid. Credit trading makes multistate collaboration easier than with the Utility Rate approach.	Can provide many or all of the benefits of Full Rate-Based Trading while leaving the decision whether to trade up to the utility or other unit-owning entity.

MASS-BASED APPROACHES			RATE-BASED APPROACHES		
Utility Budget	**Full Budget Trading at Unit Level**	**Utility Budget w/ Optional Trading**	**Utility Rate**	**Full Rate-based Trading at Unit Level**	**Utility Rate w/ Optional Trading**
Challenges of the Approach					
Because this approach does not allow trading of excess allowances, it probably would not result in least-cost outcome. Presents challenges for small utilities or coops, and for merchant generators that have less to work with on their systems. State must allocate shares of the state budget to utilities. Multistate collaboration is more cumbersome than it is with Full Budget Trading.	State must distribute or allocate the allowances. State must overcome any reluctance to use a mass-based compliance metric and to allow trading.	By making trading optional, the state must administer two kinds of compliance. State must allocate shares of the state budget to utilities. Need to consider the market impacts of some utilities not opting for trading—for example, does not opting in to trading change the interaction with the wholesale electricity market?	Crediting for energy efficiency, renewables and other activities makes this approach more complex than its mass-based counterpart. Without the flexibility to leverage the lowest cost emission reductions regardless of where they are located, this approach is not likely to result in the least-cost outcome. Presents challenges for small utilities or coops, and for merchant generators that have less to work with on their systems. Multistate collaboration more cumbersome than full trading and requires state goals to be averaged together.	Crediting for energy efficiency, renewables and other activities makes this approach more complex than its mass-based counterpart. Multistate collaboration more complex than mass-based counterpart because it requires that state goals be averaged together; and crediting mechanisms will differ substantially from state to state unless there is coordination on the development. No experience with this approach. Timing of credits issuance and availability a concern.	By making trading optional, the state must administer two kinds of compliance. Crediting for energy efficiency, renewables and other activities makes this approach more complex than its mass-based counterpart. Multistate collaboration more complex than mass-based counterpart because: requires state goals to be averaged together; and crediting mechanisms will differ substantially from state to state unless there is coordination on the development.

Appendix A-1

MASS-BASED APPROACHES

Straw Man for Utility Budget Approach

Under a utility budget approach, the state allocates shares of its mass-based state emissions budget to each utility (and other plant-owning entities). This allows the utility to then manage its budget of allowed tons across its entire fleet of affected electric generating units.[26] The flexibility inherent in this approach is often referred to as "bubbling" because it creates a figurative bubble over all of the utility's affected units, allowing the utility to distribute the allowed tons in its budget while meeting its other obligations to supply and deliver electricity to its consumers.[27] There is no trading of allowed tons with other entities.

In many states, utilities may be in a strong position to manage the responsibilities for achieving emissions goals because they own affected electric generating units and can make investments in those units to improve heat rates, help decide when units operate and what fuels they burn, and they also implement energy efficiency and renewable energy programs for the benefit of their customers. Even in those states, however, other entities own affected units, such as cooperatives, municipal producers, and merchant generators and these entities may not have the same options as larger utilities.

The utility budget approach can be summarized in the following steps:

1. EPA issues the final 111(d) regulations, including the state goals and the timeline for achieving those goals.
2. The state converts the rate-based state goal to emissions budgets for each year or multi-year period. Because the conversion may entail a certain amount of discretion on the part of the state, it may be helpful to consult with EPA on the conversion to make sure the budget will be approved as part of the state's plan.[28]
3. The state allocates shares of its state emissions budget to each utility or plant-owning entity. In some cases the owners will be merchant generators, even in states that remain vertically integrated, and sometimes the owners will be cooperatives or municipal utilities. Allocating shares of the state emissions budget is challenging because the number of allowed tons in the budget is finite, and each utility will make the case for a bigger share of the budget. Examples for apportioning the budget between utilities and other relevant entities include using historic emissions, using a standard formula based on historic generation or heat input, using an updating, output-based approach, or developing a custom approach to apportion the budget for each year.
4. Owners of affected units are required to measure, monitor and report their carbon dioxide emissions.[29] Emissions for each affected unit are tracked in an emissions tracking system. EPA currently maintains a database of CO_2 emissions from each unit as reported each quarter with other pollutant data to EPA's Clean Air Markets Division. Alternatively, states could create an emissions tracking system tailored specifically to this program.
5. Because the allowed emissions budget is allocated at the utility level, it covers all of the utility's affected units. The utility can manage its portfolio to determine the optimal approach to using its allowed emissions budget in tons, reducing emissions where necessary, all through a change in dispatch, heat rate improvements, a shift to lower or zero-carbon generation, investments in end-use energy efficiency, or any other measure that has the effect of reducing emissions at the utility's affected units.
6. At the end of the prescribed time period—often referred to as the compliance period—the utility must demonstrate that the aggregate emissions from all of its affected units remain at or below its allowed emissions budget for those plants. This can take the form of a compliance statement from the utility.[30]
7. If the total emissions from the utility's affected units are less than the allowed budget, the state could allow the owner to carry any "unspent" portion of the allowed emissions budget forward to subsequent years—i.e., allow the

26 In this straw man, we use the term "affected electric generating unit (EGU)" or "affected unit" as distinguished from "covered power plant" because it is more precise. A power plant may have multiple units, only some of which are actually covered by the 111(d) plan.

27 In mass-based approaches, we distinguish between the tons of CO2 emitted by plants from the "allowed tons" or "allowances" that represent emissions that are allowed under the mass-based approach.

28 Some commenters on EPA's June 2014 proposal have suggested that EPA prescribe specific emissions budgets to states in the final rule. If EPA does this, then states will not need to convert the rate-based goal to a mass-based equivalent.

29 This emissions measurement, monitoring and reporting requirement is included in the operating permits for affected units, making the requirement enforceable against the affected unit by the state or EPA.

30 The requirement to "cover" an affected unit's emissions in this way would be included in each affected unit's operating permit, making it an enforceable requirement against the unit by the state or EPA. New operating permit conditions are "rolled" into air operating permits when they are renewed periodically, at least once every 5 years.

unused allowed tons to be "banked".[31] Banking can provide a kind of "rainy day fund" of unused allowed tons to be used by the utility in the future, for example, in a year with higher than usual electricity demand or less than usual hydro-electric generation.

8. If at the end of a compliance period a utility's affected units have emitted more carbon dioxide than the allowed budget (plus any saved or banked allowances from prior time periods), then the utility is out of compliance and subject to enforcement by the state (and ultimately EPA or a citizen's group if the state fails to enforce). One challenge here is that enforcement may require that any shortfall be tied to a specific affected unit. The utility could be required to specify in its compliance statement what units in the fleet are covered and which plants fall short.[32]

9. Without trading, utilities cannot transfer unused allowed tons to other utilities or owners, nor can they purchase unused allowed tons from others to use for compliance.

10. The mechanism is most easily implemented in a single state, but where a multi-state utility seeks the ability to move tons from its budget in one state to its budget in another state, the two states would both need to utilize the utility budget approach (or some mass-based approach where tons can be separated from the state and allow the movement of tons across state lines in a manner approved by EPA).

The current regulatory proposal from EPA would generally allow this approach. Changes in the way EPA's proposal contemplates multi-state collaboration may be necessary and would facilitate trading across multiple states taking this approach. Greater clarity around the availability and extent of banking would also help states taking a mass-based approach understand the interaction, if any, between the interim compliance period and future compliance periods.

Benefits of the Utility Budget Approach

- The mass-based utility budget approach allows limited flexibility for utilities to manage their allowed tons of carbon dioxide across all of their affected units and it does so through a fairly simple policy framework.
- Because carbon dioxide emissions are already measured, monitored and reported from the affected units, there would be no need to set up a new emissions monitoring and reporting mechanism.

Challenges of the Utility Budget Approach

- Because the utility budget approach does not allow trading of unused allowed tons to other utilities that may need the tons, it may not result in the lowest cost compliance and does not offer as much protection against reliability concerns.
- Settling on an approach to allocate shares of the state's allowed emissions budget could present a challenge where utilities and other plant-owning entities argue for larger shares of the allowed state emissions budget.
- Smaller entities that own covered power plants will have fewer options for meeting their emissions budgets than large investor-owned utilities. Because smaller entities will have fewer options, the lack of flexibility could have both cost and reliability impacts. For example, if an entity owns only one affected electric generating unit, then it can potentially make improvements to the unit's heat rate and perhaps switch fuels or co-fire a lower carbon fuel, but once those measures are taken the owner can only control emissions by curtailing generation. In contrast, under a trading approach the same owner could purchase tons of emissions budget (i.e., allowances) from another owner to allow it to operate.
- Though it is possible, moving tons from one state to another is more cumbersome than it would be in an emissions budget trading context where the state issues and tracks allowed tons, called "allowances" and permits them to be transferred from one plant owner to another in a fluid manner.

31 We note that EPA is silent on the specific rules for banking. It seems likely that tons can be banked within the 10-year interim compliance period from 2020 to 2029, but it is not clear whether tons banked can be carried past 2029 into the 3-year final compliance period.

32 This requirement to list affected units in a compliance statement, detailing which units are "covered" by allowed tons in the budget and which are not, would be inserted into each unit's operating permit, making it enforceable by the state or EPA.

Appendix A-2

MASS-BASED APPROACHES

Straw Man for Plant-Level Emissions Budget Trading Approach

Under an emissions budget trading approach, a state starts with its allowed emissions budget, or the total number of tons that may be emitted from all of the affected electric generating units in the state for each year. Emissions allowances are issued by the state with each allowance representing an authorization to emit one ton of carbon dioxide. Affected electric generating units must track and report their covered emissions. At specified intervals, affected units must turn in sufficient allowances to cover their emissions. This is an approach already used for power plants to control emission of sulfur dioxide and nitrogen oxides under federal air regulatory programs.

Emissions budget trading is the most flexible of the mass-based options, because the owners of power plants decide whether to buy or sell allowances based on where the most cost-effective emission reduction opportunities are located. Implementing the emissions budget trading approach can be done as follows:

1. EPA issues the final 111(d) guidelines to states, including the state goals and the timeline for achieving those goals.

2. The state converts the rate-based state goal to emissions budgets for each year. Because the conversion may entail a certain amount of discretion on the part of the state, it may be helpful to consult with EPA on the conversion to make sure the budget will be approved as part of the state's plan.

3. States develop the trading infrastructure, which consists of an emissions and allowance tracking system, or EPA could make available a system that states can use.[33] As mentioned, a similar system already exists serving existing emissions budget trading programs.

4. The state issues allowances—one allowance for each allowed ton of emissions in the state's emissions budget for each year. For tracking purposes, each allowance is assigned a serial number that includes a vintage (year), since they would only be usable in the year for which they are issued and, if banked, any future year. Borrowing of allowances from future years is typically not allowed or only allowed under specific limited circumstances (e.g., within a 3-year compliance period) to avoid delaying emissions reductions indefinitely.

5. The state distributes the allowances. Because allowances are electronic, this distribution occurs by moving the allowance serial numbers into owners' accounts within the electronic allowance tracking system. Allowances can be allocated to owners and operators of covered power plants based on past emissions or periodically based on the plants' output. Some states have chosen to auction allowances in similar programs. Deciding who gets allowances and how many is challenging, but allowances have value and allocation also presents the state with an opportunity to address equity and other concerns.

6. Owners of affected units are required to measure, monitor and report their carbon emissions. This is already being done under the Clean Air Act.[34]

7. Emissions for each affected unit are tracked in an emissions tracking system. EPA already maintains an emissions tracking system with carbon dioxide, sulfur dioxide, and nitrogen oxides reported each quarter from every affected unit in the United States. The state could either use that system or create a separate emissions and allowance tracking system for purposes of the 111(d) carbon dioxide trading program. In effect, each electric generating unit has an emissions "account" with a tally of how many tons the unit has emitted in each compliance period.

8. Because the allowances are freely transferable, an allowance price will arise by operation of the market.[35] Power plant owners that need additional allowances will purchase them from other power plant owners at the going market price. In some cases, plant owners will take steps to reduce their emissions because doing so will free up allowances that can be sold to other plant owners for whom it is cost-effective to purchase allowances. In this manner, the reductions occur where they are most cost-effective and the allowances "flow" to the plants that will use them most cost-effectively.

33 Here it bears noting that because this is a mass-based approach, there is no need to develop and adopt evaluation, measurement and verification protocols and crediting mechanisms for energy efficiency or renewable generation. The tracking needs would be limited to emissions (tons of CO2) and allowances (permits to emit a ton).

34 The requirement to measure, monitor and report carbon dioxide emissions is included in the operating permits for affected units, making the requirement enforceable against the unit by the state or EPA.

35 The market for emissions allowances arises on its own without government intervention. When buyers and sellers come together—usually with the help of emissions brokers—a market price is "discovered". When used, allowance auctions assist with price discovery. Emissions brokers also play a role in price discovery.

9. At the end of the prescribed time period—often referred to as the compliance period—the owner of the affected unit must surrender enough allowances to cover the unit's emissions.[36] Once used for compliance, surrendered allowances are retired from the allowance tracking system and may not be used again. If all of a unit's emissions are "covered" by allowances, then the unit is in compliance.

10. If at the end of a compliance period an owner's affected units have emitted more tons of carbon dioxide than the number of allowances surrendered by the owner (and the power plant), then the owner is out of compliance and subject to enforcement by the state (and ultimately EPA or a citizen's group if the state fails to enforce). For existing programs of this type, enforcement consequences, established in advance through regulation, typically involve a requirement that is less attractive than non-compliance, such as to submit two allowances for every ton of exceedance and pay a financial penalty. For this reason, these types of emissions budget programs have had high rates of compliance, often 100%.

11. Unused allowances can be "banked" for future use. Banking can provide a kind of "rainy day fund" for power plant owners in case the need for or cost of allowances increases in the future. Banking allows lower cost emission reductions in one year to reduce the cost of compliance in a future year. This temporal flexibility over when emissions reductions occur provides an additional means of cost containment and benefits system reliability.

12. The emissions budget trading approach could be implemented in a single state, but efficiencies will improve with wider adoption. Each individual state can choose to allow its affected units to use allowances from other states. Allowances could be accepted from states with a voluntary or mandatory trading mechanism, so long as EPA has approved the emissions budgets for those states and the systems in the other states are approved by EPA as having integrity. A system has integrity if there is no "printing" of unauthorized allowances so as to exceed the EPA-approved state emissions budget. The tracking of allowances must prevent double counting or double surrender of the same allowance.[37]

The June 2014 regulatory proposal from EPA would generally allow this approach. Changes in the way EPA's proposal contemplates multistate collaboration would facilitate trading across multiple states taking this approach. Greater clarity around the availability and extent of banking would also help states taking a mass-based approach understand the interaction, if any, between the interim compliance period and future compliance periods.

Benefits of the Emissions Budget Trading Approach

- The emissions budget trading approach allows significant flexibility and cost-effectiveness because a plant can either reduce its emissions or purchase allowances from another plant that can reduce emissions more inexpensively.
- Because carbon dioxide emissions are already measured, monitored and reported from the power plants, there would be no need to set up a new emissions monitoring and reporting mechanism. Allowance systems that allow for allowance accounts and transfers between accounts are also widely in use and could be easily applied to the carbon context.
- The approach allows for smooth interaction with competitive wholesale power markets, because the allowance price is an operating cost, much like fuel cost, that power plants add to their bids to the independent system operator (ISO) or regional transmission organization (RTO), thereby affecting dispatch by the ISO/RTO.
- The approach is easily implemented across multiple states so long as allowances in the different states have integrity, i.e., each allowance equals a ton of emissions, and the program has enforceable requirements to ensure that generating units comply with the requirement to cover their compliance period emissions with allowances. This integrity is something EPA will presumably require before approving a state 111(d) plan.
- Smaller entities will have similar compliance flexibility when it comes to compliance as larger players, at least in comparison to the utility-focused options under consideration for 111(d) plans.

Challenges of the Emissions Budget Trading Approach

- Determining a method for distributing emissions allowances presents a challenge for state regulators, because the emissions budget is finite and individual plant owners will each argue for a larger share of that budget.

36 This requirement to surrender sufficient allowances to cover emissions is included as a condition in the unit's operating permit, making it enforceable against the unit by the state or EPA.

37 If states that link choose to use separate allowance tracking systems, there must be a system to prevent the double surrender of the same allowance. The easiest way is to use a single allowance tracking system for any state that links. Alternatively, there could be a centralized interface to individual state tracking systems that prevents double surrender of allowances.

Appendix A-3

MASS-BASED APPROACHES

Straw Man for Utility Budget Approach with Optional Trading

The utility budget approach with optional trading borrows from the two other mass-based approaches under consideration by states and stakeholders: the utility budget approach and emissions budget with trading approach. Under both of these mass-based approaches, the aim is to provide flexibility for owners and operators of affected units to achieve emissions reductions at lower cost. A utility budget approach with optional trading would allow utilities (and other plant-owning entities) the flexibility to meet an emissions budget across their fleets, and the option to participate in emissions trading with others that also choose to participate in trading. The approach could be implemented in a single state or across multiple states. States could create the infrastructure for trading to occur across state lines.

The utility budget approach with optional trading can be summarized in the following steps. Note that steps 1 through 8 are identical to the utility budget approach described in Appendix A-1:

1. EPA issues the final 111(d) regulations, including the state goals and the timeline for achieving those goals.

2. The state converts the rate-based state goal to emissions budgets for each year. Because the conversion may entail a certain amount of discretion on the part of the state, it may be helpful to consult with EPA on the conversion to make sure the budget will be approved as part of the state's plan.

3. The state allocates shares of its state emissions budget to each utility or plant-owning entity. In some cases the owners will be merchant generators, even in states that remain vertically integrated, and sometimes the owners will be cooperatives or municipal utilities. Allocating shares of the state emissions budget is challenging because the number of allowed tons in the budget is finite, and each utility will make the case for a bigger share of the budget. Examples for apportioning the budget between utilities and other relevant entities include using historic emissions, using a standard formula based on historic generation or heat input, using an updated output-based approach, or developing a custom approach to apportion the budget for each year.

4. Owners of affected units are required to measure, monitor and report their carbon dioxide emissions.[38] Emissions for each affected unit are tracked in an emissions tracking system. EPA currently maintains a database of CO_2 emissions from each unit as reported each quarter with other pollutant data to EPA's Clean Air Markets Division. Alternatively, states could create an emissions tracking system tailored specifically to this program.

5. Because the allowed emissions budget is allocated at the utility level, it covers all of the utility's affected units. The utility can manage its portfolio to determine the optimal approach to using its allowed emissions budget in tons, reducing emissions where necessary, all through a change in dispatch, heat rate improvements, a shift to lower or zero-carbon generation, investments in end-use energy efficiency, or any other measure that has the effect of reducing emissions at the utility's affected units.

6. At the end of the prescribed time period—often referred to as the compliance period—the utility must demonstrate that the aggregate emissions from all of its affected units remain at or below its allowed emissions budget for those plants. This can take the form of a compliance statement from the utility.[39]

7. If the total emissions from the utility's affected units are less than the allowed budget, the state could allow the owner to carry any "unspent" portion of the allowed emissions budget forward to subsequent years—i.e., allow the unused allowed tons to be "banked".[40] Banking can provide a kind of "rainy day fund" of unused allowed tons to be used by the utility in the future, for example, in a year with higher than usual electricity demand or less than usual hydro-electric generation.

8. If at the end of a compliance period, a utility's affected units have emitted more carbon dioxide than the allowed budget (plus any saved or banked allowances from prior time periods), then the utility is out of compliance and subject to enforcement by the state (and ultimately EPA or a citizen's group if the state fails to enforce). One challenge here is

38 This emissions measurement, monitoring and reporting requirement is included in the operating permits for affected units, making the requirement enforceable against the affected unit by the state or EPA.

39 The requirement to "cover" an affected unit's emissions in this way would be included in the each affected unit's operating permit, making it an enforceable requirement against the unit by the state or EPA.

40 We note that EPA is silent on the specific rules for banking. It seems likely that tons can be banked within the 10-year interim compliance period from 2020 to 2029, but it is not clear whether tons banked can be carried past 2029 into the 3-year final compliance period.

that enforcement may require that any shortfall be tied to specific affected units. The utility could be required to specify in its compliance statement what units in the fleet are covered and which plants fall short.[41]

9. If the utility or other plant-owning entity opts into a trading mechanism, then:

9.1. The state issues the owner emissions allowances in an amount equal to the number of allowed tons in its emissions budget for each year. Allowances are deposited by the state into the owner's allowance account, which is part of the allowance tracking system.[42]

9.2. At the end of each compliance period, the plant owner must surrender enough allowances to cover its emissions during the compliance period. The state extinguishes the surrendered allowances from the owner's account in the allowance tracking system. This is handled electronically.

9.3. Allowances that are not surrendered are bankable and can be saved for future compliance periods. Or those allowances may be transferred to other owners of affected units that need those allowances (or to other entities with accounts in the allowance tracking system).

9.4. States will establish the optional trading infrastructure, which consists of an emissions and allowance tracking system, or EPA could make a system available that states and their affected units can opt into.[43] These systems are in use for sulfur dioxide and nitrogen oxides.

9.5. The mechanism could be implemented in a single state, but efficiencies are likely to improve with wider adoption. Each individual state can choose to allow its affected units to surrender allowances from other states. Allowances could be accepted from states with a voluntary or mandatory trading mechanism, so long as EPA has approved the emissions budgets for those states and the systems in the other states are approved as having integrity. A system has integrity if there is no "printing" of unauthorized allowances, compliance is required and enforced, and the tracking of allowances occurs in a manner that prevents no double counting or double surrender of the same allowance. In addition, a consistent unit of trade, i.e., one allowance allows one ton of emissions, and enforcement that makes compliance more economically attractive than non-compliance will facilitate the use of out-of-state allowances and the inter-changeability of allowances between states.

41 This requirement to list affected units in a compliance statement, detailing which units are "covered" by allowed tons in the budget and which are not, would be inserted into each unit's operating permit, making it enforceable by the state or EPA.

42 Allowance tracking systems are electronic systems with electronic web-based user interfaces that are already in use in the United States and could be adapted to the carbon dioxide context. Such a system maintains accounts established by owners and other entities and provides a means for transferring allowances and surrendering the allowances at the end of each compliance period.

43 Here it bears noting that because this is a mass-based approach, there is no need to develop and adopt evaluation, measurement and verification protocols and crediting mechanisms for energy efficiency or renewable generation. The tracking needs would be limited to emissions (tons of CO_2) and allowances (permits to emit a ton).

The current Clean Power Plan proposal from EPA would generally allow this approach. Changes in the way EPA's proposal contemplates multistate collaboration would facilitate trading across multiple states taking this approach. Greater clarity around the availability and extent of banking would also help states taking a mass-based approach understand the interaction, if any, between the interim compliance period and future compliance periods.

Benefits of the Utility Budget Approach with Optional Trading

- This approach allows utilities and other plant owners to decide whether trading of emissions budgets is most cost-effective and otherwise in their interests. Having the option to trade is presumably better than not having the option and provides additional opportunities to hedge against future uncertainty and ensure affordable, reliable power.
- Under this approach, utilities would automatically have the limited flexibility that comes with being able to manage their emissions budgets across their portfolios (at a minimum, within the state). States then would delegate to utilities the decision on whether trading makes the most sense to the utilities. If the trading approach allows significant flexibility and cost-effectiveness because a plant can either reduce its emissions or purchase allowances from another plant that can reduce emissions more inexpensively, then the utilities will make the decisions to trade. Otherwise they will manage their budgets without trading.
- Because carbon emissions are already measured, monitored and reported from the affected units, a new emissions monitoring and reporting mechanism would not be necessary. Allowance systems that permit allowance accounts and transfers between accounts are also widely used and could be easily applied to the carbon context.
- The approach is easily implemented across multiple states for those utilities that opt into trading so long as allowances in the different states have integrity, i.e., each allowance equals a ton of emissions. This integrity is something EPA is expected to require before approving a state 111(d) plan.

Challenges of the Utility Budget Approach with Optional Trading

- Allocating shares of the state emissions budget to utilities presents a challenge to state regulators, because the emissions budget is finite and utilities will each argue for a larger share of that budget.
- By making trading optional, there is a possibility larger utilities will not opt for trading and the smaller players will be left with fewer cost-effective options for compliance than they would have if all plant owners were part of the trading approach.

Appendix B-1

RATE-BASED APPROACHES

Straw Man for the Utility Rate Approach

Under a rate-based utility approach, the state prescribes an emissions rate for each utility (or other plant-owning entity). Each utility then manages its fleet of covered power plants to meet the prescribed rate through actions at the plants themselves or activities like energy efficiency that avoid emissions at the plants through energy savings. The flexibility inherent in this approach is often referred to as "bubbling" because it creates a figurative bubble over all of the utility's affected units, allowing the utility in the rate-based context to average the emissions performance across all of its affected units.

In many states, utilities may be in a strong position to manage the responsibilities for achieving emissions goals because they own affected electric generating units and can make investments in those units to improve heat rates, help decide when units operate and what fuels they burn, and they also implement energy efficiency and renewable energy programs for the benefit of their customers. Even in those states, however, other entities own power plants, such as cooperatives, municipal producers and merchant generators, and these other entities may not have the same options as larger utilities.

The utility rate approach can be summarized in the following steps:

1. EPA issues the final 111(d) guidelines to states, including the state goals and the timeline for achieving those goals.

2. In its 111(d) plan, the state requires each utility or other plant-owning entity to meet the EPA-prescribed rate across the utility's portfolio. Alternatively, a state could prescribe a unique emissions rate for each utility that is based on the makeup of the utility's fleet. For example, the state could choose to subcategorize among affected units and apply different rates to different types of units (e.g., one emission rate for coal and another for gas units) and derive an aggregate rate for each utility that takes into account expected investments in energy efficiency and renewables and other creditable activities. The state would then demonstrate to EPA that the state emissions goal would be achieved if every utility meets its prescribed emissions rate.[44] In some cases the owners will be merchant generators, even in states that remain vertically integrated, and sometimes the owners will be cooperatives or municipal utilities.

3. Owners of affected units are required to measure, monitor and report their carbon dioxide emissions.[45] EPA currently maintains a database of CO_2 emissions from each unit as reported each quarter with other pollutant data to EPA's Clean Air Markets Division. Alternatively, states could create an emissions tracking system tailored specifically to this program.

4. Owners of affected units must also measure, monitor and report electricity generation.[46] Generation would also be tracked in the tracking system alongside emissions in order to monitor a plant's emissions rate (emissions per generation). Gross generation, not net generation, is currently measured and reported under federal regulations.[47]

5. Because the rate applies to the utility's fleet, the utility can manage its portfolio to determine the optimal approach to reducing emissions, whether through a change in dispatch, heat rate improvements, or a shift to lower or zero-carbon generation. Where the utility or other entity owns a single affected unit or a small number of affected units, there will be much less flexibility inherent in this approach because those entities will have fewer options for improving emissions performance.

6. Under EPA's proposal, states may provide credit for carbon emissions avoided through energy efficiency projects and renewable electricity generation, and potentially other activities. In a utility rate approach, that crediting would take the form of adjustments to the utility's average emissions rate. The state would establish protocols and rules for crediting energy efficiency, renewables and other allowed activities that the utility itself applies to its utility emissions rate. Under this approach, no tradable credits would be necessary.[48] The state could also set up a credits desk where it would take application from sponsors of creditable activities, review applications and issue credits. Utilities could then use those credits to adjust their overall emissions rate.

44 While theoretically possible, applying different rates for different utilities within a state would greatly increase the complexity of this approach and would make multi-state collaboration much harder if not impossible.

45 This emissions measurement, monitoring and reporting requirement is included in the operating permits for affected units, making the requirement enforceable against the affected unit by the state or EPA.

46 The requirement to measure, monitor and report generation would be included in an operating permit condition for each affected unit, making the requirement enforceable by the state or EPA.

47 40 CFR Part 75.

48 If tradable credits were issued by the state, that would make this approach the equivalent of a plant-level rate-based trading program, discussed in Appendix B-2.

7. Developing protocols and procedures for crediting energy efficiency, renewables and other activities allowed by EPA is a challenge for this and all rate-based approaches. The crediting mechanism will have to be transparent and enforceable by the state and EPA.

8. At the end of the prescribed time period—often referred to as the compliance period—the owner of the covered plants must demonstrate that the average emissions rate across all of its plants remains at or better than the prescribed emissions rate after adjusting the rate to reflect the avoided emissions from energy efficiency, renewables and other creditable activities. This demonstration could take the form of a compliance statement that includes the state-approved adjustments made by the utility to reflect energy efficiency, renewables and other creditable activities.

9. If at the end of a compliance period an owner's covered plants have not achieved the prescribed emissions rate on average, then the owner is out of compliance and subject to enforcement by the state (and ultimately EPA or a citizen's group if the state fails to enforce).

10. Without a trading mechanism, utilities cannot transfer unused "credits" to other utilities or owners, nor can they purchase unused credits from others and use them for compliance.

11. In the rate-based utility approach, coordination between states presents a steep challenge because EPA's proposal required coordinating states to merge their state goals in order to connect their programs—a requirement that in the rate-based context means significant changes in state goals.[49] A rate-based policy that extends beyond a single unit is based on averaging two rates to achieve the same emissions benefit. To achieve the same benefit, a generation-weighted average is necessary, including between two states. A policy that allows credits from neighboring states with different rates could lead to perverse outcomes, such as shifts in generation toward the state with the less stringent rate, a significant competitiveness issue that could stymie collaboration between the states by making it unappealing. Two or more states could come together to allow a multi-state utility to manage its obligations across state lines through a fleet-wide averaging and use of crediting across its portfolio, but these issues would need to be addressed in order to achieve the intended outcome of state goals.

Benefits of the Utility Rate Approach

- The utility rate approach allows limited flexibility for utilities to manage their emissions rates across all of their affected units.

Challenges of the Utility Rate Approach

- Because the utility rate approach allows emissions rate averaging only across the affected units in a utility portfolio, and does not allow utilities to trade credits to other utilities that may need them, it may not result in the lowest cost compliance.

- The rate-based approach requires a mechanism for the crediting of energy efficiency and renewable energy, as well as any other activity that will be credited. In the energy efficiency context, this means adopting evaluation, measurement and verification (EM&V) protocols for assessing energy savings across a large number of different kinds of energy efficiency measures, and possibly then attributing an emissions result to those savings in tons of avoided emissions. This is a general challenge for all rate-based approaches that is not unique to the utility rate approach.

- Smaller entities that own affected units will have fewer options for meeting their emissions rates than large investor-owned utilities. Because smaller entities will have fewer options, the lack of flexibility could have both cost and reliability impacts. For example, if an entity owns only one affected unit, then it can potentially make improvements to the plant's heat rate and perhaps change the fuel(s) used at the unit, but once those measures are taken the owner may still fall short of meeting the prescribed rate. In contrast, under a trading approach, the same owner could purchase credits from another owner to allow it to operate.

- Though possible, averaging across a multi-state utility's units in two or more states is more cumbersome than in a trading context where credits or allowances can be fluidly transferred from one plant owner to another. It may also require that states average their state emissions goals—a very steep challenge for states. Some states would have to accept a tougher average rate than the starting rate from EPA—a situation that is not present in the mass-based context.

49 When two different rates are merged, a new weighted average rate results. In contrast, when two mass-based emissions budgets are combined, there is no need to change the state budgets because they are additive.

Appendix B-2

RATE-BASED APPROACHES

Straw Man for Rate-based Trading Approach

A rate-based trading approach entails applying a prescribed emissions rate to all affected units. An affected unit that generates electricity at an emissions rate that is lower than the prescribed rate will generate emissions credits. A unit that generates electricity at a rate that is higher than the prescribed rate will need to use credits to adjust its rate downward. In this way, units that exceed the prescribed emissions rate can continue to generate electricity as long as the generation is offset with credits. In effect, the emission rates are averaged across all units in the system and all unit owners.

Certain activities that do not automatically improve the emissions rates of affected units—such an energy efficiency and renewable electricity—can be credited by states. These credits can also be used by unit owners to offset rates that exceed the prescribed emissions rate. As with all rate-based approaches, developing and implementing a crediting mechanism represents a significant challenge for states that choose a rate-based approach.

Implementing the rate-based trading approach can be summarized as follows:

1. EPA issues the final 111(d) guidelines to states, including the state goals and the timeline for achieving those goals.
2. The state applies the rate-based state goal to each affected unit, meaning the unit must either generate electricity at or below the prescribed emissions rate, or turn in emissions credits to offset its generation. As an alternative to applying the same rate to all affected units, a state could subcategorize among affected units and apply different rates to different types of units (e.g., one emission rate for coal and another for gas units) so long as the state could demonstrate that overall the state emissions rate goal would be met.
3. Owners of affected units are required to measure, monitor and report their carbon dioxide emissions.[50] EPA currently maintains a database of CO_2 emissions from each unit as reported each quarter with other pollutant data to EPA's Clean Air Markets Division. Alternatively, states could create an emissions tracking system tailored specifically to this program.
4. Owners of affected units must also measure, monitor and report electricity generation.[51] Generation would also be tracked in the tracking system alongside emissions to monitor a plant's emissions rate. Gross generation, not net generation, is currently measured and reported under federal regulations.[52]
5. Any affected unit that operates at lower than the prescribed emissions rate will earn credits as they generate electricity. Those credits will be deposited in the plant's credit account by the state.
6. The state will need to establish a credit tracking system with a credit account for each affected unit where credits earned are deposited by the state. Transfers between accounts will be administered to allow affected units with credits to be transferred to units that need the credits. This will offset generation that exceeds the prescribed emissions rate.
7. Unit emissions rates can be improved through heat rate improvements, fuel switching or co-firing with lower or zero carbon fuels. In most states, however, credits will be necessary in order to operate units with higher emissions rates. Some credits will come from units that operate below the prescribed rate, but units in many states will also rely on crediting for energy efficiency and renewables and other creditable activities.
8. Under EPA's proposal, states may provide credit for avoided carbon emissions resulting from energy efficiency projects and renewable electricity generation, and potentially other activities. The state would establish protocols and rules for crediting energy efficiency, renewables and other allowed activities. The state would establish a "credits desk" that would receive applications from energy efficiency project proponents. The state would then apply the protocols and rules to those applications and issue credits.
9. Developing protocols and procedures for crediting energy efficiency, renewables and other activities allowed by EPA presents a challenge for this and all rate-based approaches.
10. At the end of the prescribed time period—often referred to as the compliance period—the owner of the affected units must demonstrate that each unit meets the prescribed emissions rate after adjusting the rate to reflect the credits submitted for the unit, if applicable.
11. If at the end of a compliance period a unit has not operated at or below the prescribed rate, or turned in credits sufficient to offset a unit's operating at above the prescribed rate, then the unit is not in compliance and subject to enforcement by the state (and

50 This emissions measurement, monitoring and reporting requirement is included in the operating permits for affected units, making the requirement enforceable against the affected unit by the state or EPA.

51 The requirement to measure, monitor and report generation would be included in an operating permit condition for each affected unit, making the requirement enforceable by the state or EPA.

52 40 CFR Part 75.

ultimately EPA or a citizen's group if the state fails to enforce).

12. Unused credits can be "banked". Banking can provide a kind of "rainy day fund" for affected units in case the need for credits increases in the future.

13. States will develop the trading infrastructure, which consists of an emissions, generation and credit tracking system, or EPA could establish a system that states and their affected units can use.

14. In the rate-based trading approach, coordination between states presents a steep challenge because EPA's proposal requires coordinating states to merge their state goals in order to connect their programs—a requirement that in the rate-based context means significant changes in state goals.[53] A rate-based policy that extends beyond a single unit is based on averaging two rates to achieve the same emissions benefit. To achieve the same benefit, a generation-weighted average is necessary, including between two states. A policy that allows compliance demonstration using credits from neighboring states with different rates could lead to perverse outcomes such as potential shifts in generation toward the state with the less stringent rate, a significant competitiveness issue that could stymie collaboration between the states. Despite these issues, there is no technical reason why two states could not come together, agree to a weighted average rate and allow plants in one state to use credits that originate in another state for compliance purposes.

The June 2014 regulatory proposal from EPA would generally allow this approach. Changes in the way EPA's proposal contemplates multistate collaboration would facilitate trading across multiple states taking this approach. Greater clarity around the availability and extent of banking would also help states taking a rate-based approach understand the interaction, if any, between the interim compliance period and future periods.

Benefits of the Rate-based Trading Approach

- The rate-based trading approach allows significant flexibility and cost-effectiveness. A unit can either improve its emissions rate or purchase credits from (a) another unit that can reduce emissions more inexpensively or (b) the holder of credits resulting from energy efficiency, renewable energy or other creditable activities.
- The approach allows for smooth interaction with competitive wholesale power markets because the credit price can be added to the bids made by generators to the independent system operator (ISO) or Regional Transmission Organization (RTO), thereby affecting dispatch by the ISO or RTO. The credits earned by units that operate below the prescribed emissions rate (for the most part, natural gas combined cycle plants) will be subtracted from those plants' bids.
- Credit trading means that linking among states is more easily accomplished, though EPA proposed that states would have to merge their state rates in order to collaborate, a requirement that presents significant challenges as compared to the mass-based context.
- Smaller entities will have similar flexibility when it comes to compliance as larger players, at least in comparison to some other options under consideration for 111(d) plans.

Challenges of the Rate-based Trading Approach

- Developing and implementing the protocols and procedures for reviewing applications for emissions credits based on avoided emissions from energy efficiency, renewables and other creditable activities is a challenge. For energy efficiency credits, for example, there will be a need to establish (or gain approval of existing) evaluation, monitoring and verification methods for assessing energy savings from energy efficiency measures, and to devise acceptable methods of crediting those energy savings.
- Multi-state collaboration with a rate-based approach entails numerous challenges:
  - If EPA requires that states average their state emissions goals together to create a new emissions goal applicable in the cooperating states, a high bar is set for collaboration in a rate-based context because some states will be left with more stringent state goals as a price for collaborating.
  - On the other hand, trading between states with different emissions goals could undermine the environmental outcome and prove difficult because of the competitiveness issues presented by those different goals.
  - Because states have different energy efficiency programs, states will need to agree to accept credits from another state's energy efficiency programs despite different program scope, different EM&V protocols, and potentially different methods for attributing emissions results to measures. Alternatively, the challenge will be in coordinating these items to makes sure they are acceptable across numerous states intending to collaborate.

53 When two different rates are merged, a new rate results. In contrast, when two mass-based emissions budgets are combined, there is no need to change the state budgets because they are additive.

Appendix B-3

RATE-BASED APPROACHES

Straw Man for Utility Rate Approach with Optional Trading

The utility rate approach with optional trading borrows from the two other rate-based approaches under consideration by states and stakeholders: the utility rate approach and the rate-based trading approach. Under both of these rate-based approaches, the aim is to provide flexibility for owners and operators of affected electric generating units to achieve the prescribed emissions rate in a least-cost manner. A utility rate approach with optional trading would allow utilities (and other owners of power plants) the flexibility to meet an emissions rate across their fleets, and the option to participate in emissions credit trading with others that also choose to participate in trading. The approach could be implemented in a single state or across multiple states. States—ideally with EPA assistance—could create the infrastructure for trading to occur across state lines.

The utility rate with optional trading approach can be summarized in the following steps. Note that steps 1 through 9 are identical to those steps in the utility rate approach straw man:

1. EPA issues the final 111(d) guidelines to states, including the state goals and the timeline for achieving those goals.
2. In its 111(d) plan, the state requires each utility or other plant-owning entity to meet the EPA-prescribed rate across the utility's portfolio. In some cases the owners will be merchant generators, even in states that remain vertically integrated, and sometimes the owners will be cooperatives or municipal utilities.
3. Owners of affected units are required to measure, monitor and report their carbon dioxide emissions.[54] EPA currently maintains a database of CO_2 emissions from each unit as reported each quarter with other pollutant data to EPA's Clean Air Markets Division. Alternatively, states could create an emissions tracking system tailored specifically to this program.
4. Owners of affected units must also measure, monitor and report electricity generation.[55] Generation would also be tracked in the tracking system alongside emissions in order to monitor a plant's emissions rate (emissions per generation). Gross generation, not net generation, is currently measured and reported under federal regulations.[56]
5. Because the rate applies to the utility's fleet, the utility can manage its portfolio to determine the optimal approach to reducing emissions, whether through a change in dispatch, heat rate improvements, or a shift to lower or zero-carbon generation. Where the utility or other entity owns a single affected unit or a small number of affected units, there will be much less flexibility inherent in this approach because those entities will have fewer options for improving emissions performance.
6. Under EPA's proposal, states may provide credit for carbon emissions avoided through energy efficiency projects, renewable electricity generation, and potentially other activities. In a utility rate approach, that crediting would take the form of adjustments to the utility's average emissions rate. The state would establish protocols and rules for crediting energy efficiency, renewables and other allowed activities that the utility itself applies to its utility emissions rate. Under this approach, no tradable credits would be necessary.[57]
7. Developing protocols and procedures for crediting energy efficiency, renewables and other activities allowed by EPA is a significant challenge for this and all rate-based approaches. The crediting mechanism will have to be transparent and enforceable by the state or EPA.
8. At the end of the prescribed time period—often referred to as the compliance period—the owner of the covered plants must demonstrate that the average emissions rate across all of its plants remains at or better than the prescribed emissions rate after adjusting the rate to reflect the avoided emissions from energy efficiency, renewables and other creditable activities. This demonstration could take the form of a compliance statement that includes the state-approved adjustments made by the utility to reflect energy efficiency, renewables and other creditable activities.
9. If at the end of a compliance period an owner's covered plants have not achieved the prescribed emissions rate

54 This emissions measurement, monitoring and reporting requirement is included in the operating permits for affected units, making the requirement enforceable against the affected unit by the state or EPA.

55 The requirement to measure, monitor and report generation would be included in an operating permit condition for each affected unit, making the requirement enforceable by the state or EPA.

56 40 CFR Part 75.

57 If tradable credits were issued by the state, that would make this approach the equivalent of a plant-level rate-based trading program, discussed in Appendix B-2.

on average, then the owner is out of compliance and subject to enforcement by the state (and ultimately EPA or a citizen's group if the state fails to enforce).

10. If the owner of affected units opts into a trading mechanism, then the state would:

    - issue credits to units that operate at an emissions rate lower than the prescribed emissions rate and deposit those credits into the credit accounts set up for the units.
    - establish a "credits desk" where the state would accept applications for credits based on avoided emissions resulting from energy efficiency projects, renewable energy and other creditable activities. Credits, once issued, would be deposited into the credits accounts of the applicants, from which they can be transferred to buyers of the credits and into the credit accounts of affected units for compliance purposes.
    - require units that exceed the prescribed emissions rate at the end of each compliance period to turn in credits to offset their higher rates and adjust them to meet the required rate. The offsetting credits will be transferred into the unit's credit account by the end of the compliance period to demonstrate that the unit is in compliance. The state extinguishes the surrendered credits from the owner's account in the credit tracking system. This is handled electronically.
    - Credits that are not surrendered are bankable and can be saved for future compliance periods.[58]

11. States will develop the optional trading mechanism, which consists of an emissions, generation and credit tracking system, or EPA could establish a system that states and their affected units can use.

12. In the rate-based utility approach with optional trading, coordination between states presents a steep challenge because EPA's proposal requires coordinating states to merge their state goals in order to connect their programs—a requirement that in the rate-based context means significant changes in state goals.[59]

Benefits of the Utility Rate Approach with Optional Trading

- This approach allows utilities and other plant owners to decide whether trading of credits is most cost-effective and otherwise in their interests.
- Utilities will automatically have the limited flexibility that comes with being able to manage their emissions rate across their portfolios. States can delegate the decision on whether trading makes the most sense to the utilities.
- If selected, trading allows significant flexibility and cost-effectiveness because a unit can either improve its emissions rate or purchase credits from (a) another unit that can reduce emissions more inexpensively or (b) the holder of credits resulting from energy efficiency, renewable energy or other creditable activities.
- Credit trading means that linking among states is more easily accomplished once states merge their rate-based goals into one regional average goal.
- With trading, smaller entities will have similar compliance flexibility as larger players, at least in comparison to some other options under consideration for 111(d) plans.

58 EPA is silent on the specific rules for banking. It seems likely that tons can be banked within the 10-year interim compliance period from 2020 to 2029, but it is not clear whether tons banked can be carried past 2029 into the 3-year final compliance period.

59 When two different rates are merged, a new rate results. In contrast, when two mass-based emissions budgets are combined, there is no need to change the state budgets because they are additive.

Challenges of the Utility Rate Approach with Optional Trading

- Developing and implementing the protocols and procedures for reviewing applications for emissions credits based on avoided emissions from energy efficiency, renewables and other creditable activities is a challenge. For energy efficiency credits, for example, there will be a need to establish (or gain approval of existing) evaluation, monitoring and verification methods for assessing energy savings from energy efficiency measures, and to devise acceptable methods of attributing avoided emissions to those energy savings.
- Multi-state collaboration with a rate-based approach entails numerous challenges:
  - If EPA requires that states average their state emissions goals together to create a new emissions goal applicable in the cooperating states, a high bar is set for collaboration in a rate-based context.
  - On the other hand, trading between states with dramatically different emissions goals could undermine the environmental outcome and may prove difficult because of the competitiveness issues those different goals present.
- Because states have different energy efficiency programs, states will need to agree to accept credits from another state's energy efficiency programs despite different program scope, different EM&V protocols, and potentially different methods for attributing emissions results to measures. Alternatively, the challenge will be in coordinating these items to makes sure they are acceptable across numerous states intending to collaborate.

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About the Partnering Organizations

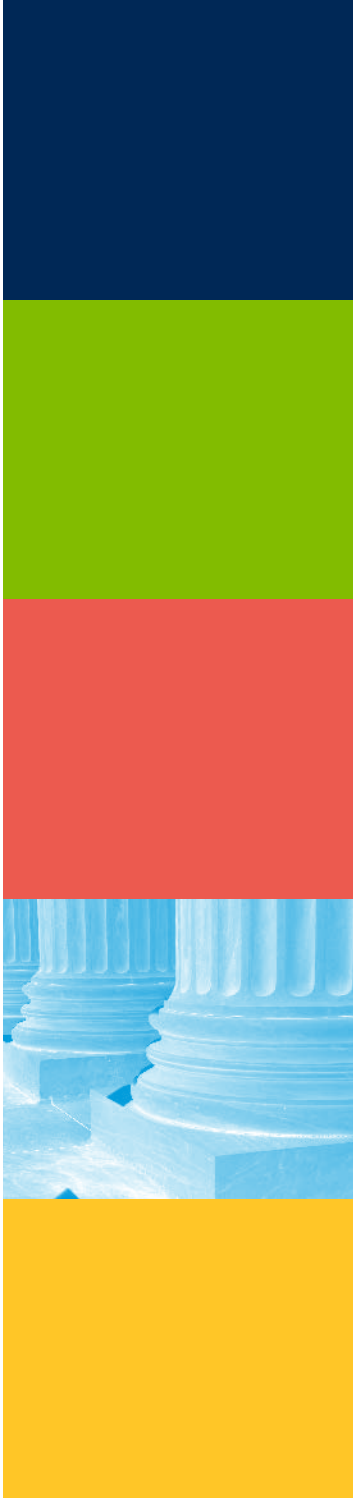
Great Plains Institute

The Great Plains Institute is a non-partisan, non-profit organization that convenes and helps diverse interests forge agreement on solutions to our most important energy challenges. Engaging partners and stakeholders at national, regional, state and community levels, our programs span a range of key priorities, including energy efficiency, energy infrastructure and markets, fossil energy, renewable energy, and transportation.

Bipartisan Policy Center

Founded in 2007 by former Senate Majority Leaders Howard Baker, Tom Daschle, Bob Dole, and George Mitchell, the Bipartisan Policy Center (BPC) is a nonprofit organization that drives principled solutions through rigorous analysis, reasoned negotiation, and respectful dialogue. With projects in multiple issue areas, BPC combines politically balanced policymaking with strong, proactive advocacy and outreach.

This report was prepared to further understanding and stimulate discussion of the issues covered. The conclusions reached in this document do not necessarily reflect the views of the Great Plains Institute or the Bipartisan Policy Center, their founders, or boards of directors.



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