NEXTGEN CLIMATE AMERICA

Potential Emission Leakage Under the Clean Power Plan and a Proposed Solution

A Comment to the United States Environmental Protection Agency on the Clean Power Plan Proposed Rule
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NextGen Climate America
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I. Summary

The Clean Power Plan is an essential step forward to end unlimited dumping of carbon pollution into our atmosphere from the largest source in the United States — existing power plants. EPA's proposal ("Proposal") establishes state-specific emission rate targets for each state based on a technical and economic assessment of the opportunities each state has to reduce emissions from the regulated sources covered by the standard. While there is considerable room for improvement in EPA's assessment of each building block and the formula used to combine them, EPA's basic approach — a bottom-up assessment leading to an individualized target for each state — is legally and technically sound.

The differences in emission rate targets among the states, however, could lead to higher overall emissions than anticipated ("emissions leakage") if states with relatively low emission rate targets increase their electricity imports from states with relatively high targets. (In this context states that elect to implement an environmentally equivalent mass-based target can be treated as having an emission rate standard of 0 lbs/MWh because such a standard does not allow any increase in emissions associated with any increase in generation within such state beyond the level of growth already accounted for in the standard.) Potential differences in how states account for new fossil generation could further erode the projected emissions reductions.

Our analysis finds that these two factors, if left uncorrected in the final rule, could significantly reduce the effectiveness of the proposal. Technically, some states could rely entirely on leakage to demonstrate compliance with the proposal by shifting generation into states with higher rate standards or replacing existing generation with new sources that may emit at a higher rate. Under reasonable economic assumptions and transmission constraints, leakage could eliminate nearly 30% of the expected emissions reductions from the Clean Power Plan.

EPA's final rule should require state plans to prevent emissions leakage. This requirement is needed to ensure that state plans deliver environmental results equivalent to those anticipated by EPA based on achieving state targets without relying on an increase in unaccounted-for net electricity exports/imports.

As with other aspects of their plans, states would retain discretion to determine their own approach to preventing emissions leakage. This paper describes several approaches states could take to prevent leakage, including developing regional compliance plans and compensating for any increase in emissions associated with increases in net electricity exports. It also describes one way that electricity market administrators could adjust real-time market rules to eliminate implicit generation subsides that could encourage emission leakage.

II. The Source of Potential Emission Leakage

Differences in state emission rate standards do not in themselves pose a fundamental problem for achieving cost-effective emission reductions under the Clean Power Plan. Each state can achieve significant emission reductions from its starting point by deploying additional clean resources within the state while improving the performance of existing resources and reducing reliance on the most emitting sources. EPA's proposal develops state emission rate standards by applying such in-state emission reduction building blocks to each state's 2012 starting point. The reductions achieved through this system of emissions reduction presume that net electricity exports/imports for each state remain constant at 2012 levels throughout the compliance period. If states comply, in part or in whole, by increasing imports of electricity from states with higher emission rates without making any correction to their emissions performance calculation to reflect the change, total emissions would be higher than under a scenario in which net imports don't change. The magnitude of this change could be sufficient to significantly reduce the effectiveness of EPA's proposal.

The basic mechanism by which emissions increase is straightforward. Consider first the situation if two states do not engage in trading of carbon credits or other compliance instruments but are participants in the same power market. We describe this situation as independent compliance. Assume total generation in the two states combined stays the same and that each state remains exactly in nominal compliance with its respective rate standard: If State A has an emission rate standard of 1000 lbs/MWh and State B has an emission rate standard of 1500 lbs/MWh, then shifting 1 MWh of generation from State A to State B will increase emissions in State B by 1500 pounds and decrease emissions in State A by 1000 pounds. The shift in generation results in a 500-pound net increase in total emissions.

Consider the following example, in which both State A and State B are assumed to maintain a constant level of energy consumption in all scenarios:

<u>Independent Compliance with No Power Trades</u>

> State A generates 100 MWh at its standard of 1000 lbs/MWh, producing emissions of 100,000 lbs.
>
> State B generates 100 MWh at its standard of 1500 lbs/MWh, producing emissions of 150,000 lbs.

Total power generation: 200 MWh. Total emissions: 250,000 lbs.

Independent Compliance within a Common Power Market:

Let us assume that the marginal generation cost in state A is greater than in state B because of its lower emissions rate, which causes 10 MWh of generation to shift from State A to State B.

> State A generates 90 MWh at its standard of 1000 lbs/MWh, producing emissions of 90,000 lbs.
>
> State B generates 110 MWh at its standard of 1500 lbs/MWh, producing emissions of 165,000 lbs.

Total power generation: 200 MWh. Total emissions: 255,000 lbs.

The net result is that both states remain in nominal compliance with their respective rate standards, while total emissions have increased by 5000 lbs.

Note that a mass-based emission standard is functionally equivalent to an emission rate standard of 0 lbs/MWh when it comes to leakage. If State A has an emission cap and State B has an emission rate standard of 1500 lbs/MWh, then shifting 1 MWh of generation from State A to State B results in a net emission increase of 1500 lbs because emissions do not change in State A (again, assuming the state maintains exact compliance with its emissions cap) while emissions in State B are allowed to increase by 1500 lbs of CO_2 as a result of the additional 1 MWh of generation.

Note further that emission leakage occurs strictly as a result of shifting generation from a state with a lower emission rate standard (or cap) to a state with a higher emission rate standard, independent of any agreement to allow trading of emission credits between states.[1]

This point is illustrated by the following example of joint compliance using emissions trading.

Joint Compliance with Emissions Credit Trading:

Let's assume that State A over complies and sells emission credits to State B.

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[1] In the Western Resource Advocates *Carbon Reduction Credit Program* Working Paper, Steven Michel and John Nielsen suggest that credit trading between states with different emission rate standards would result in leakage and suggest discounting such credits based on the difference in emission rates between the states. Their example, however, does not hold total generation in each state constant. Closer examination shows that the emission leakage attributed to credit trading by Michel and Nielsen is actually a result of shifting generation from the lower emission rate state to the higher emission rate state. *Available at* http://www.westernresourceadvocates.org/energy/pdf/CRC%20Program%20-%20WRA%20working%20paper%208%2025%2014.pdf

> State A generates 100 MWhs with an average emission rate of 900 lbs/MWh, producing emissions of 90,000 lbs.
>
> State B generates 100 MWhs with an average emission rate of 1600 lbs/MWh, resulting in total emissions of 160,000 lbs.

State A's allowed emissions were 100,000 lbs, so it would have 10,000 lbs of emission credits it could sell to State B, assuming State B entered into an agreement to accept credits from State A.

State B's excess emissions of 10,000 lbs would be compensated by the credits obtained from State A.

Total power generation: 200 MWh. Total emissions: 250,000 lbs.

In this example there has been no shift in electricity generation and no change in total emissions. The emission credit trade does not change total emissions even though the states involved in the trade have different emission rate standards.

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III. Policy Recommendations to Reduce Leakage Potential

To reduce the technical potential for leakage that we have identified, EPA should adopt the following policy recommendations in its final rule.

1. All state plans must have provisions to prevent leakage:
    a. Responsibility could be assigned to states that increase net exports or reduce net imports;
    b. Alternatively, responsibility could be assigned to states that increase net imports or reduce net exports.

2. Set consistent rules for the treatment of all new fossil resources:
    a. Allowing states to elect to include or exclude new sources results in high leakage potential;
    b. If it is not feasible to require all states to account for new sources then all states should be required to exclude both new source emissions and generation from their compliance demonstrations.

3. Consistent with EPA's proposed methodologies for translating rate standards to mass standards, states that adopt a mass-based standard must either —
    a. Exclude generation served by new sources from the load used to convert from a rate standard to a mass standard; or
    b. Adopt a standard that is based on the inclusion of these megawatt-hours and count the emissions from new sources against the standard.

4. EPA should revise the methodology for treatment of Energy Efficiency as a component of BSER to credit states for 100% of reduced generation to support statewide sales, regardless of whether the state is a net importer or exporter (provided that EPA requires states to prevent leakage due to interstate electricity trades).

IV. Technical Leakage Potential in the Proposal

In order to determine the potential for leakage in the Clean Power Plan, NextGen Climate America examined several scenarios under which states could appear to maintain compliance with either a rate or mass standard while failing to achieve a level of environmental performance equivalent to or better than what would be achieved through the BSER. These scenarios assess the technical potential for leakage due to a failure to account for incremental interstate electricity trading above the 2012 baseline levels and due to an inconsistent or inadequate accounting for the affects of new NGCC generation.

Our analysis defines leakage as emissions that occur in excess of EPA's proposed mass targets for states that are inclusive of new generation (EPA's Method 2 or "Method 2"), as described in EPA's November 6, 2014 Technical Support Document.[2] ("Nov. 6 TSD") Nationwide performance by this metric is approximately equal to the projected emissions performance in EPA's Regulatory Impact Analysis.

Our assessment of technical leakage potential excludes the possibility for electricity trades among states that do not have significant transmissions connections. We assume that all states will use increased generation to serve in-state load before increasing net exports. Where states are supposed to decrease generation for the sake of meeting a mass standard in scenarios 4, 6, and 7, we presumed that covered 2012 sources are curtailed in order from most to least emissions-intensive. All states are assumed to comply exactly with the form of standard they are presumed to adopt in the scenario, whether the standard is rate- or mass-based. California and all states that participate in the Regional Greenhouse Gas Initiative are presumed to adopt mass standards in all scenarios.[3]

We modeled seven scenarios that examine two major categories of leakage potential: (A) Leakage that may occur purely as a result of incremental exports from states that adopt a rate standard without adding any new fossil generation, and (B) Leakage that results from the strategic siting or inadequate accounting for new NGCC generation. Significant leakage potential exists in all scenarios.

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[2] *Available at* http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-notice-additional-information-regarding.

[3] Scenarios involving changes to interstate electricity trades also exclude leakage potential resulting from increased incremental exports to California. This conservative assumption is made in order to minimize complex interactions between California's "First Deliverer" rule under the state's Global Warming Solutions Act and any prospective Clean Power Plan compliance plan in the state.

(A) Leakage from rate states increasing exports with no new NGCC:

Scenario 1: Incremental Exports Available through Building Blocks

Scenario 1 examines leakage potential that exists where some states implement a rate standard by applying the building block components of BSER, but are able to generate more electricity from existing resources than the state is projected to require in order to meet load in 2029. These states are assumed to export this surplus electricity to states that are assumed to adopt a mass standard.

This scenario identifies the potential for significant leakage. For example, we found that Ohio alone could generate 18 million surplus MWh for export to New York, resulting in 12 million tons of excess emissions. Aggregate national leakage potential for this scenario is 88 million tons – 15% of total projected abatement in 2030.

Scenario 2: Incremental Exports Available if Existing and Under-Construction NGCC Operates at Increased Capacity Factor

Scenario 2 examines the potential for leakage that may occur under similar assumptions to Scenario 1, with the exception that existing NGCC is presumed to operate at a maximum capacity factor of 75% and under-construction NGCC is presumed to have a maximum capacity factor of 85%. Leakage potential in Scenario 2 is higher than in Scenario 1, as would be expected under these assumptions. For example, potential leakage that would result from incremental exports from Ohio to New York increases to 15 million tons in this scenario, compared to 12 million tons in Scenario 1. Aggregate national leakage potential for this scenario is 108 million tons – 18% of total projected abatement in 2030.

(B) Leakage from new NGCC emissions not accounted for correctly

Scenarios 3 & 4: Projected New NGCC Sited Strategically

Scenarios 3 and 4 adopt the findings of IPM modeling carried out by ICF on behalf of the Natural Resources Defense Council, which identified economic levels of new NGCC generation to be built in each of several regions of the country, based on implementation of EPA's Proposal. In each of these scenarios, we assume the new NGCC projected for a given region is sited strategically within that region rather than being sited in the state that seeks to buy the energy from each new unit.

Scenario 3 assumes all of the new NGCC generation for each region is sited within a state in that region that has a high rate standard and strong transmission connections to other states within the region. Generation above projected load for the state where the new sources are sited is exported to states that adopt a mass standard.

Scenario 3 shows high leakage potential because, sited in this manner, the new generation can serve to both artificially lessen the average emissions rate for the state where it is built and help the importing state meet its mass standard without reducing emissions from in-state generation that serves its load. For example Indiana can generate 18 million surplus MWh for export to Illinois, resulting in 14 million tons of leakage. In the West, Montana can increase net exports to Oregon by 5 million MWh, resulting in 4.5 million tons leakage, with leakage occurring at a rate of 0.9 tons per incremental MWh exported. Aggregate national leakage potential for this scenario is 177 million tons – 30% of total projected abatement in 2030.

Scenario 4 assumes the same facts, but examines leakage that results if surplus electricity is exported from a state with a higher rate standard to a state with a lower rate standard. This scenario results in lower levels of leakage, and is highly sensitive to the variation in rate standards among importing states. For example, Kentucky can generate 16 million surplus MWh for export to Mississippi, resulting in 8.5 million tons leakage (a leakage rate of just over .5 tons per MWh), while Montana can export 5 million MWh to Washington resulting in leakage of 4 million tons at a leakage rate of .8 tons per MWh.[4] Aggregate national leakage potential for this scenario is 80 million tons – 13% of total projected abatement in 2030.

Scenarios 5 – 7: Building to Compliance

Scenarios 5 – 7 remove the constraints on the levels to new NGCC that is projected under scenarios 3 and 4. Instead, these scenarios presume states may build as much new NGCC as is needed to bring a state into compliance with its standard. These scenarios reflect more leakage potential than may be likely given economic considerations for replacing existing sources with new generation. Nevertheless, the technical potential and financial incentive for leakage that exists in these scenarios raises significant cause for concern.

Scenario 5 assumes states with high rate standards build enough new NGCC to reduce the statewide emissions rate enough to meet the standard. Surplus electricity is exported to states that adopt mass standards. This scenario identifies very high technical potential for leakage. Under this scenario many states could build their way to compliance while exporting surplus electricity to neighboring states. For example, Iowa alone could generate 29 million surplus MWh for export to neighboring states, resulting in 19 million tons leakage.

Scenario 6 examines the leakage potential that results from states adopting a mass standard using EPA's Method 1 based only on generation from 2012 affected

[4] Because the leakage rate is based on the difference between the rate standards of the states involved in a transaction, the leakage rate (in terms of tons leakage per MWh transacted) between Montana and Washington is 60% higher than the leakage rate between Kentucky and Mississippi.

sources. Under this version of the mass standard, states are not currently required to account for emissions from new generation megawatt-hours that replace megawatt-hours from existing sources. In this scenario we presume that states reduce generation from existing sources until the standard is met, and supply all displaced and incremental electricity from new sources.

To the extent that combined emissions from new and existing sources exceed levels that would occur under EPA's Method 2, which establishes a standard based on both categories of sources, the standard does not achieve environmentally equivalent performance, and leakage occurs. This scenario also identifies very high technical leakage potential. For example, the technical leakage potential in Florida alone is 13 million tons.

Scenario 7 examines potential leakage that occurs if states that adopt rate standards are permitted to optionally include or exclude emissions from new NGCC when demonstrating compliance with a rate standard. In this scenario, states with rate standards lower than the average emissions rate of a new NGCC unit are presumed to exclude consideration of this generation and its associated emissions when making a demonstration of compliance. All other states are presumed to include consideration of these new sources.

In scenario 7, leakage occurs to the extent that emissions from a new NGCC unit exceed the state's rate standard. For example, New Jersey's rate standard is 537 lbs CO_2/MWh in 2029. If a new NGCC unit operates with an emissions rate of 866 lbs/MWh, New Jersey's leakage in scenario 7 occurs at a rate of 329 lbs CO_2 for each megawatt-hour that is not accounted for under the standard. New Jersey could generate 5 million tons of leakage by shifting 21 million MWh from existing generation to new generation and serving incremental load with new generation.

V. EPA has the Authority and Responsibility to Require State Plans to Address Leakage

EPA should require that state plans include sufficient measures to address the possibility for significant leakage to occur.

The principle that state-level implementation must meet or surpass the minimum standard set by the federal government lies at the heart of the Clean Air Act's cooperative federalism framework. But where state plans do not include measures to prevent and correct for potential leakage, our analysis shows that the environmental performance of the Clean Power Plan may be seriously compromised.

State plans must demonstrate that they will be enforced and will achieve a level of performance no less stringent than what can be achieved through EPA's best system of emissions reductions. It is incumbent upon EPA to require state plans to include measures to prevent leakage as part of this demonstration of equivalence and enforceability.

It is implicit in the EPA's authority to regulate greenhouse gases from the power sector that it must also have authority to enforce the level of stringency that is proposed in that policy. As the EPA notes repeatedly in its Legal Memorandum,[5] the electric power sector is interconnected across many states and regions, which would make leakage transactions very likely in the absence of any prohibition or corrective policy. The requirement that states not rely on leakage to create the appearance of compliance while failing to produce a satisfactory level of environmental performance may therefore be implicit in the proposal. Nevertheless, EPA should explicitly clarify this requirement by directly addressing the need to account for emissions attributable to increases in net electricity exports during the compliance period.

EPA rightly recognizes the need for states to address the interstate effects as a State Plan Consideration, and the Proposal specifically seeks comment on how best to address these effects.[6] Of particular concern to EPA is the possibility that, due to the

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[5] See Technical Support Document: "Legal Memorandum for Proposed Carbon Pollution Emission Guidelines for Existing Electric Utility Generating Units," available at http://www2.epa.gov/sites/production/files/2014-06/documents/20140602-legal-memorandum.pdf, at 43 *et seq*., discussing the significance of the interconnected nature of the electricity system and of CO_2 as a global pollutant that is well-mixed in the atmosphere. This document mentions the "interconnected nature of the [grid/electric system]" at least 17 times.

[6] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule, *Preamble*, 79 Fed. Reg. 34,917 (June 18,

interconnected nature of the electricity system, individual states' demonstrations of equivalent or better performance may be impaired and that emissions reduction measures not be double-counted. While EPA provides examples of these effects that may be associated with energy efficiency programs on a shared electricity system and renewable energy imports and exports, our analysis shows that these concerns are special cases of the more general issue that exists for all states that engage in import and export transactions with other states.

Similarly, EPA recognizes that many states are likely to build new Natural Gas Combined Cycle (NGCC) generation, which may directly or indirectly affect the emissions performance of those states. EPA has requested comment on how best to account for the existence and affects of new NGCC in state plans. As we show in these comments, this new generation can have a significant impact on the environmental performance of both the state in which it is built and on any states with which it engages in electricity trade. For this reason, it is crucial that EPA require states to both account for new fossil generation in a consistent manner and account for incremental imports or exports in their demonstrations of performance.

In general, states must ensure that "any material component of a state requirement or program included in a state plan that could affect emission performance . . . must be accurately represented."[7] To fulfill this requirement, states must account for how both incremental electricity trades and new fossil generation affect the environmental performance of the state plan. Because both of these factors have the potential to seriously undermine the environmental performance of the plan, states should also be required to include measures to prevent leakage due to these factors as a component of their state plans.

Demonstration of Equivalent or Better Performance

For a state plan to be approvable, it must achieve a level of environmental performance no less stringent than could be achieved through implementation of EPA's best system of emissions reduction. The state must make this demonstration of equivalence regardless of the form of standard that a state adopts (whether mass- or intensity-based).

This level of performance is premised upon states achieving genuine emissions reductions by improving performance of existing resources and/or meeting in-state energy needs with cleaner resources. Neither of these criteria is satisfied if states that adopt a mass standard merely shift emissions to neighboring states to create the illusion of reductions in their power sector. Nor are these criteria satisfied by

2014) (to be codified at 40 C.F.R. pt. 60). See also Technical Support Document "State Plan Considerations," 84–96

[7] 79 Fed. Reg. 34,922.

states that adopt a plan that ignores the effects of new fossil generation on both in-state and interstate emissions performance.

Where a state increases overall generation and increases exports to a neighboring state that does not account for the emissions associated with that electricity, emissions may actually increase in both states. When two states either increase or maintain constant emissions, the emissions reductions required by EPA guidelines evaporate, compromising the environmental performance of individual state plans and of the rule as a whole. Therefore any demonstration of equivalence must account for the role incremental imports and exports play in affecting in-state power sector emissions.

Similarly, states may increase overall emissions by redispatching generation from existing sources to new fossil sources regulated under the new source performance standards in section 111(b) of the Clean Air Act. If mass standards are set under the assumption that the existing fleet generates a forecast number of megawatt-hours, but many of these megawatt-hours are generated instead by new NGCC sources without any adjustment to maintain the stringency of the original mass standard, overall emissions could increase significantly, again compromising the environmental performance of state plans and of the rule as a whole. A similar outcome may occur if states may elect whether or not to consider the generation and/or associated emissions from new fossil generation when establishing a standard of performance or demonstrating compliance with that standard.

EPA requests comment on matching real world emissions performance to compliance plan targets in the *Preamble.* EPA emphasizes the importance of this issue in its technical support document, *Projecting EGU Emission Performance*:

> As discussed in the preamble, the EPA is striving to find a balance between providing state implementation flexibility and ensuring that the emission performance required by CAA section 111(d) is properly defined in state plans and that plan performance projections have technical integrity. The credibility of state plans under section 111(d) will depend in large part on ensuring credible and consistent emission performance projections in state plans.[8]

This request for comment indicates that the mere adoption of a numerical rate standard equal to the number contained in the proposal is not sufficient to demonstrate that a state plan will achieve the required level of performance.

For a state plan to demonstrate the required level of performance, it must adopt standards that are "equivalent to or better than the levels of the rate-based CO_2

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[8] Technical Support Document, *Projecting EGU Emission Performance*, 3. See also *Preamble* §VII(F)(7).

emission performance goals in Table 1 of this Subpart."[9] The levels reflected in Table 1 provide numerical emissions rate targets, but these *targets* should not be construed as being identical to the level of *stringency* a plan must achieve.

Rather, standards of performance must "*reflect the degree of emission limitation achievable* through the application of the ''best system of emission reduction'' that, taking into account the cost of achieving such reduction and any non-air quality health and environmental impacts and energy requirements, the Administrator determines has been adequately demonstrated (BSER)."[10]

As EPA indicates in the *Preamble*, the proposed state goals merely reflect the "stringency of application of the measures in each of the building blocks"[11] that make up the BSER. The degree of emission limitation reflected in EPA's formulation of the BSER is based on a suite of measures that either improve the performance of existing sources or "reduce the unit's CO2 emission total *to the extent that generation can be shifted from higher-emitting fossil fuel-fired EGUs to lower- or zero-emitting options*."[12] The BSER does not contemplate shifting generation out of state or to new resources that will not reduce pollution.

Among the measures that displace high-emitting resources, EPA considers increased dispatch of lower-emitting resources, new or retained zero-emitting resources, and demand-side efficiency measures that reduce the need to operate all supply-side resources. Any of these options will result in a net decrease in emissions compared to a business-as usual scenario. Increased reliance on out-of-state fossil generation will not achieve this result and is therefore not considered a component of BSER. For the same reason, states should not be permitted to treat incremental imports as a zero-carbon compliance tool.

EPA has requested comment on the ways to define appropriate state-level goals and demonstrations of compliance based on consideration of new fossil capacity. While EPA correctly indicates that, "Under a mass-based plan where an emission limit on affected EGUs would assure achievement of the required level of emission performance in the state plan, any emission reductions at affected EGUs resulting from substitution of new NGCC generation for higher-emitting generation by existing affected EGUs would automatically be reflected in mass emission reductions from affected EGUs." [13]

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[9] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule at §60.5740(3)(ii).
[10] 79 Fed. Reg. 34,834 (June 18, 2014) (Emphasis added).
[11] *Id*. at 34,851.
[12] *Id*. at 34,835. (Emphasis added).
[13] 79 Fed. Reg. 34,877, 34,924

The guidance EPA provides in the Nov. 6 TSD[14] begins to address how the existence of this new NGCC generation should be accounted for to "assure achievement of the required level of emission performance in the state plan" by offering a rate to mass translation methodology that allows states to base a standard on anticipated generation from both new and existing sources. For the methodology that bases the mass translation only on 2012 affected sources, however, EPA contemplates the substitution of new NGCC for "higher-emitting generation," but ignores the incentive states will have to substitute new NGCC even for low-emitting sources. To correct for this perverse incentive, this guidance should be supplemented with provisions for adjusting a Method 1 mass standard (which is based on 2012 affected sources only) to ensure the appropriate levels of stringency.[15]

BSER Treats 2012 as the Baseline Year for Electricity Imports

Each of the building block components of BSER measures emissions performance improvements compared to the 2012 baseline year, and accounts for these changes in calculating the states' emissions rate targets. This calculation includes each state's level of net electricity imports as a constant. Where import levels increase relative to this baseline, the stringency of the rate target or of a mass target that is based on it will also be affected. Just as states will account for changes in fossil generation, renewables, and efficiency throughout the compliance period, the demonstration of compliance should also account for changes in the level of imports.

Building Block Four of EPA's BSER calculation assesses the potential for energy efficiency to contribute to emissions rate reductions. To determine the size of the contribution, EPA projects percentage savings figures for states throughout the compliance period. These megawatt-hours associated with these percentage savings levels are determined by multiplying a given year's savings percentage by statewide sales in 2012, scaled up by a 7.51% correction factor to account for avoided transmission and distribution losses. For states with negative net imports, this number is then included in the denominator. For states with positive net imports, the megawatt-hour savings number is multiplied by state generation as a percentage of sales.

While the level of savings projected scales up throughout the compliance period, the net import percentage and the statewide sales figure that determine the efficiency megawatt-hour contribution to the emissions intensity denominator remain constant. In this manner, EPA's methodology treats 2012's import levels as a constant.

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[14] See fn. 2, *supra*.

[15] An appropriate mechanism may adjust the mass standard to exclude megawatt-hours of generation from existing sources that have been replaced by new fossil generation. See *infra* at Preventing Leakage from New NGCC in Mass Standard States, pp. 28 *et seq*.

Because EPA's numerical rate standards reflect the level of stringency associated with the application of the building blocks in BSER within each state, states that purport to comply in part or whole by relying on changes in imports or exports (among other mechanisms that EPA has not contemplated as part of BSER), should be required to show that the change will not adversely affect the level of performance associated with the plan. It is highly likely that net imports will fluctuate from year to year even in the absence of concerted efforts to leak emissions, and that these changes can have significant leakage effects. Therefore all state plans should be specifically required to include a process for maintaining the required level of performance reflected in the original BSER if net import levels fluctuate by more than a *de minimis* amount.

Requiring States to Prevent Leakage does not Compromise State Flexibility

EPA has provided states with considerable flexibility with respect to how they implement the law, but that flexibility is predicated on the requirement that states achieve the level of performance articulated in EPA's proposal. The preamble to the proposed rule specifies that EPA seeks to provide flexibility "where permitted by statute, particularly with respect to the range of measures that a state could include in a plan," but not with respect to the overall emissions performance of the plan: "We view the proposed goals as providing rigor where required by the statute with respect to the amount of emission reductions."[16]

In the absence of a firm requirement that state plans achieve equivalent environmental performance to EPA's proposal, the cooperative federalism structure of the Clean Air Act would break down. The result would be a *de facto* devolution to a purely state-driven process, in which states determine not only how to implement the law, but also whether and to what extent to implement it.

EPA's BSER calculation is based on the projection that in-state fossil generation resources continue to operate at a constant level throughout the compliance period and that renewable resources and energy efficiency savings contribute additional zero-emission megawatt-hours to the compliance calculation over time. In EPA's October 28, 2014 Notice of Data Availability (Oct. 28 NODA), the agency requests comment on adopting a methodology that treats these zero-emission resources on par with existing NGCC as available tools for reducing the states' reliance on existing fossil resources.[17] We recommend EPA adopt this adjustment to the BSER calculation.

But whether EPA adopts the adjustment to the BSER calculation or not, the BSER does not provide for treating incremental imported or exported electricity as a compliance tool. If EPA does not require states to account for incremental electricity

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[16] 79 Fed. Reg. 34,837.

[17] 79 Fed. Reg. 64,543 (October 30, 2014).

trade, it is implicitly allowing electricity imports and exports to contribute towards compliance as if there were no emissions associate with these imports.

EPA should therefore clarify that states cannot sweep emissions associated with incremental electricity imports and exports under the rug. Instead, EPA should exercise its authority to require that states include emissions associated with these net trades in demonstrations of compliance. States should not be permitted to simply adopt a rate standard with no regard for how that standard is achieved or how that rate standard adopted will perform compared to the levels of carbon pollution reduction contemplated in EPA's proposal.

Therefore, for a state plan to be approvable, EPA should require that states not only adopt a numerical emissions rate standard (or an equivalent mass standard) that matches the standard proposed by EPA; states must also demonstrate that the application of this standard will achieve a level of performance equivalent to or better than the approach described by the EPA.

Accounting for and preventing potential leakage in no way impacts states' ability to take advantage of the full suite of available carbon reduction measures, develop a state plan that takes into account local circumstances, engage in multi-state plans, or otherwise take advantage of the flexibility EPA has provided. Indeed, states may determine that the optimal compliance path could involve significant changes in net imports. The requirement to address potential leakage in a state plan merely requires that such a compliance strategy compete on a level playing field with other strategies by accounting for the emissions associated with those net changes in interstate trades and correctly account for the affects of new fossil generation.

The Requirement that Credited Emissions Reductions be Non-Duplicative also Requires Addressing Leakage

Leakage transactions compromise the environmental performance of both a state that increases incremental imports and a state that increases generation to provide for this incremental imported energy. There is therefore a risk that the compliance benefit of some increased generation may be double-counted in the absence of a framework to account for and prevent leakage.

EPA's proposal requires that emissions standards and enforcing measures must be non-duplicative. A standard is non-duplicative "if it is not already incorporated as an emission standard in another state plan unless incorporated in multi-state plan."[18] A simple example shows how leakage can lead to double-counting of benefits:

> Suppose State A must achieve a rate standard of 1400 lbs/MWh and State B adopts a mass based standard. State B reduces output by 1 MWh from a

[18] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule at §60.574(d).

power plant that emits 1500 lbs CO_2/MWh. A power plant in State A with an emissions rate of 1000 lbs/MWh generates one incremental MWh for export to State B. A net reduction of 500 lbs has occurred, and in the absence of any double counting, the combined benefit to both states would equal 500 lbs only.

But by importing this megawatt-hour from State A, State B is able to report a 1500-lb reduction towards its mass standard. By operating the power plant, State A generates a 400-lb credit towards its rate standard for the one megawatt –hour generated. The combined credit claimed by the two states is 1900 lbs: nearly *quadruple* the actual emissions reduction, and both states claim credit for the same action.

EPA considers the risk of double counting associated with imported renewable energy,[19] but as this example shows, renewable energy imports are only a particular case of all incremental electricity import transactions. EPA should adopt measures that address the proper accounting for all imports and exports of electricity, not merely the special cases of imports and exports associated with renewable energy and energy efficiency. The potential for double-counting exists for all such transactions. Accordingly, state plans should be required to include measures to correct for this misallocation of benefits in order to prevent double-counting of *all* kinds.

Where an entity in a state imports renewable energy that remains bundled with that energy's renewable attributes, EPA has requested comment on the suggestion that the importing state may include that renewable energy in its demonstration of compliance. As long as no other state can count either the generation or the renewable attributes of the renewable energy for the purposes of Clean Power Plan compliance, this approach will help to avoid double-counting of emissions rate reductions due to renewable energy that is traded across state lines by effectively treating this generation as occurring within the state that purchases it. Other commenters have suggested that this approach should be extended to inter-state energy efficiency investments.[20] This approach should be extended to all interstate electricity transactions between known parties and from known generation sources. As long as both the emissions and the energy output from the energy resources are allocated only to the state that imports the energy, these sources will not be double counted, and the technical potential for leakage is reduced.

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[19] See *Preamble*, 79 Fed. Reg. at 34,919-22. See also *Technical Support Document: State Plan Considerations*, 84-96, discussing Treatment of Interstate Emission Effects.

[20] See, e.g., Advanced Energy Economy, *Comments on the Clean Power Plan*, Nov. 5, 2014 at pp. 53 – 55.

In many cases, however, interstate electricity transactions do not occur through simple ownership agreements or bilateral contracts. In these cases, it may be impossible to directly trace the emissions and the generation to a single pair of importing and exporting states. The suggestions in the following section address the significant remaining leakage potential that occurs with this type of transaction.

VI. Proposed Solutions: Options for Addressing Leakage

A number of options exist for EPA and states to prevent leakage, but all successful options will contain two elements:

(1) Leakage prevention and correction measures must eliminate performance distortions that may occur as a result of changes in electricity imports and exports from all sources on an interconnected system of states with a mix of various rate and/or mass standards.

(2) Leakage prevention and correction measures must require all states to account for the existence of new fossil generation in a consistent manner that preserves the overall environmental performance of the Proposal.

Solutions that fully incorporate these two principles can effectively reduce or eliminate the technical leakage potential that we have identified in our analysis.

(1) ADDRESSING LEAKAGE ASSOCIATED WITH ELECTRICITY IMPORTS AND EXPORTS

One option to fulfill requirement (1) above would be for EPA to eliminate the option that states apply a rate standard at all, and instead provide each state with a mass standard that reflects the BSER. As another option, EPA could allow states to adopt a rate standard, but provide a mass-based backstop for states that adopt rate standards in order to ensure that no state increases emissions beyond a level environmentally equivalent to BSER. Additional flexibility may be provided within either of these options by allowing states to engage in emissions credit trading, although credit trading itself is not sufficient to prevent leakage. Either a pure mass standard or a rate standard with a mass backstop would be relatively administratively simple for states and would ensure that state plans achieve the required level of performance more certainly than the current proposal. However, both are significant departures from the existing proposal and may remove some of the state flexibility EPA has sought to provide.

EPA could also impose an average emissions rate standard for each grid region (or for the nation as a whole), again with or without the possibility that states may trade intensity-based compliance credits. These federally-driven options may also remove some amount of state flexibility, but the loss of flexibility may be somewhat offset by some increased administrative simplicity and certainty. While these changes to the form of standard would reduce leakage potential, EPA can also require states to implement leakage reduction measures without departing from the current forms of state-specific standards and options in the Proposal.

The first best state-driven solution to prevent leakage caused by incremental electricity imports/exports would be for states to join regional programs with a uniform emission rate standard within the power markets in which they participate.

Under this form of joint compliance the states are presumed to agree to a weighted average emissions rate target for the region (or all adopt mass standards, i.e., an effective emission rate standard of 0 lbs/MWh, as in RGGI).

Using a simple two-state example, suppose State A and State B each generates 100 MWh/year. State A has an emissions standard of 1000 lbs/MWh. State B has an emissions standard of 1500 lbs/MWh. The regional emission rate would be 1250 lbs/MWh = 1000 lbs/MWh in state A* (100 MWh/200 MWh) + 1500 lbs/MWh in state B* (100 MWh/200 MWh).

Adopting a uniform emission rate standard eliminates the risk of leakage; meanwhile, emission credit trading results in a uniform carbon price, ensuring efficient operation of the electricity market, with no incentive to shift generation from one state to another due to the carbon emission standards.

But some states in any given grid region may be uninterested in joining such an agreement, particularly if there is no requirement to explicitly address leakage in their state plans. By maintaining separate standards and shifting generation from State A to State B, as described in the leakage example above, State A has an opportunity to lower its compliance costs and State B has an opportunity to both lower its compliance costs and generate additional in-state economic activity.

EPA may not be able to compel states to join regional programs, but it can and should eliminate the disincentive to do so by requiring that all state plans include provisions to prevent leakage. To support such a regulatory requirement it will be important for EPA to show (in the preamble to the final rule) that states have a way to prevent leakage, even if they have to act independently without the cooperation of other states.

EPA may do this by providing a default rule that — unless a state includes a sufficiently stringent alternative leakage prevention measure — state plans must all include provisions that assign responsibility for incremental emissions associated with increased imports or exports. This default rule should apply uniformly either to importing states or to exporting states. Because states have clear authority to regulate the EGUs within their borders, these comments assume the default rule would apply to exporting states. EPA should also consider the possibility of applying the rule to importing states.

Note also that EPA's methodology under-credits the carbon pollution reduction potential of state energy efficiency programs in states that are net energy importers. Significant energy efficiency potential exists in states that import much of their electricity, but EPA has excluded these savings from the BSER calculation because the agency had not developed an effective framework for correctly attributing these emissions reductions to the state that makes the efficiency investments without double-counting the reductions.

Our proposal, whether applied to exporting or importing states, addresses this difficulty. EPA should therefore revise its BSER calculation to account for the full level of savings achievable in all states, including net importers, and allow states to claim credit for these investments accordingly, provided that states make a demonstration that the savings are not double-counted or that any double counting is corrected for through a mechanism like the one we propose here.

Exporter Responsibility:

One way to prevent emission leakage due to shifting generation from a state with a lower emission rate standard to a state with a higher emission rate standard is to retire credits based on the difference in the emissions rate standards multiplied by any increase in net exports relative to 2012.

The "export compensation obligation" (ECO) would be calculated at the state level as follows:

$$ECO = E_{B\text{->}A} (R_B - R_A)$$

Where

$E_{B\text{->}A}$ is the increase in net exports of electricity from State B into State A compared to net exports in 2012.

R_A is the emission rate standard in State A

R_B is the emission rate standard in State B

Net exports are observable at the state level, but for states that participate in regional markets it may not be possible to determine the destination of all exports. For the share of exports attributable to regional market purchases the average emission rate for the region would be substituted for R_A.

The ECO can be allocated to exporters to the extent they can be directly identified based on their control by out-of-state load serving entities or as a result of bilateral contracts. The ECO for the remaining net exports resulting from system sales could be allocated to generators in proportion to their share of state-wide generation.

Alternatively, the initial obligation could be assigned to states that increase net imports from states with a higher emission rate standard. The calculation is entirely parallel:

The "import compensation obligation" (ICO) would be calculated at the state level as follows:

$$ICO = I_{A\text{<-}B} (R_B - R_A)$$

Where

$I_{A<-B}$ is the increase in net imports of electricity into State A from State B compared to net imports in 2012.

R_A is the emission rate standard in State A

R_B is the emission rate standard in State B

Net imports are observable at the state level, but for states that participate in regional markets it may not be possible to determine the source of all imports. For the share of imports attributable to regional market purchases the average emission rate for the region would be substituted for R_B.

The ICO can be allocated to importers to the extent they can be directly identified based on their control of out-of-state generating assets or as a result of bilateral contracts. The ICO for the remaining net imports resulting from system purchases could be allocated to load serving entities (LSEs) in proportion to their share of state-wide load, or to in-state generators if the state plan does not include regulation of LSEs.

Exporter Credit Endowment

To implement this requirement a state might decide to apply the ECO to ALL exports, but establish an Exporter Credit Endowment (ECE) equal to net exports in 2012 multiplied by the emission rate standard difference. That is:

$$ECE = E_{2012}(R_B - R_A)$$

This would insure there is a net compliance obligation only for the excess exports compared to 2012 levels without the need to try to distinguish between baseline and incremental exports.

This endowment could be distributed to exporters based on their share of 2012 exports, if known, or it could be distributed in proportion to compliance year exports or generation.

ECO/ICO Numerical Example

We can see how the ECO/ICO works in the following example.

No Imports:

State A generates 100 MWh at its standard of 1000 lbs/MWh, producing emissions of 100,000 lbs.

State B generates 100 MWh at its standard of 1500 lbs/MWh, producing emissions of 150,000 lbs.

Total generation: 200 MWh. Total emissions: 250,000 lbs.

Increased Imports into State A from State B:

State A generates 90 MWh at its standard of 1000 lbs/MWh, producing emissions of 90,000 lbs.

State B generates 110 MWh at its standard of 1500 lbs/MWh, producing emissions of 165,000 lbs.

Total generation: 200 MWh. Total emissions: 255,000 lbs

So without an ECO/ICO there is a net increase in emissions of 5000 lbs.

With an ECO in place State B would be required retire credits to compensate for its increase in net exports; alternatively, with an ICO in place State A would be required to retire credits to compensate for the increase in net imports:

ECO/ICO = 10 MWh x (1500 lbs/MWh – 1000 lbs/MWh) = 5000 lbs.

This obligation will reduce emissions back to 250,000 pounds whether these credits are obtained from generators in State A or State B.

In the ECO case, this obligation could be assigned pro rata to all covered sources, which could be accomplished by reducing the applicable emission rate standard from 1500 lbs/MWh to 1455 lbs/MWh. This would reduce emissions in State B to 160,000 lbs and total emissions to 250,000 lbs.

In the ICO case incentives would be most effectively aligned if State A allocates the ICO to importers. If State A does not directly regulate LSEs as part of its plan, however, it could accomplish the required emission reduction by reducing the average emission rate of its in-state generation to 944 lbs/MWh, thereby reducing its emissions to 85,000 pounds, which would also return total emissions to 250,000 pounds. One drawback with this approach is that it further increases the emission rate difference between the two states, encouraging even more imports.

<u>Implementing the Exporter/Importer Compensation Obligation</u>

The proposed solution to leakage described above works to prevent emissions leakage by compensating for increases in electricity exports/imports with a Compensation Obligation that becomes part of a state's compliance demonstration process. There are several implementation questions that states will need to address in their plans to ensure that they remain in compliance after accounting for their ECO/ICO. EPA does not have to prescribe answers to these questions in its guideline, but it is useful to illustrate solutions that states could adopt.

Who is responsible for compensating for a change in net imports/exports?

If exporting states are responsible for countering emission leakage it is relatively straightforward to implement the requirement by imposing the obligation on the responsible generators, if they can be identified through bilateral contracts, or pro rata on all generators.

If the obligation is imposed on importing states it would be desirable to hold the entities responsible for importing power responsible. If states implement the carbon standards by creating a Carbon Reduction Credit (CRC) system as proposed by Western Resource Advocates[21] and regulators have authority over load-serving entities (LSEs) they can assign the ICO to electricity importers (or "first deliverers") by requiring them to submit CRCs in proportion to their share of the state's increase in net imports. As discussed above, this can be accomplished efficiently by distributing importer credit endowments based on 2012 imports and then requiring CRCs based on total imports during the compliance year.

In states that adopt implementation plans that only regulate covered fossil fuel generating units the ICO can be assigned to these sources in proportion to their share of covered generation in the state. Equivalently the state could adjust its emission rate target downward by the amount needed to satisfy its ICO as illustrated above.

How can real-time electricity markets be aligned with the ECO/ICO?

So far we have described the need for EPA to require state plans to prevent emission leakage and approaches states could take to account for leakage and compensate for it during the true-up period at the end of each compliance period. For states that participate in organized inter-state real-time electricity markets the market administrators may need to take an additional step to insure that dispatch decisions aren't distorted by differences in state emission rate standards, which could create a real-time market incentive that conflicts with the leakage prevention policy.

The potential problem is closely related to the origin of the leakage problem. Consider two electricity generators with identical marginal generating costs and emission rates, but located in states with different emission rate standards. The bid prices of these generators will reflect the emission rate standards of their respective states, but won't reflect the ECO/ICO, which depends on the annual statewide electricity generation/consumption balance:

[21] See fn. 1, *supra*.

$$\text{Bid price in State A} = MC + P(R - R_A) = MC + PR - PR_A$$

$$\text{Bid price in State B} = MC + P(R - R_B) = MC + PR - PR_B$$

Where

MC is the marginal generator cost

P is the price of carbon credits or equivalently the shadow price of carbon emissions (assumed in this example to be the same in both states, which would occur if these states allow credit trading).

R is the emission rate of the generators

R_A , R_B are the respective state emission standards, as defined previously.

We can see that, everything else equal, the bid price will be lower for the generator in the state with the higher emission rate standard, creating an incentive for emission leakage.

The market administrator (e.g. RTO/ISO) can prevent this distortion by determining the dispatch merit order after adjusting each bid to counteract the difference in state emission rates. The administrator would do this by adding PR_A to the bid of the generator in State A and PR_B to the bid of the generator in State B:

$$\text{Merit price in State A} = \text{Bid price in State A} + PR_A = MC + PR$$

$$\text{Merit price in State B} = \text{Bid price in State B} + PR_B = MC + PR$$

We can see that this adjustment equalizes the "merit price" of the two generators, which is the appropriate result given that the generators are identical by assumption.

State carbon price differences

If the shadow price of carbon emissions differs between states (which is likely under the Clean Power Plan if states don't join an interstate credit trading system) the economic incentive to shift generation will depend on the relative carbon prices as well as the relative emission rate standards, and may or may not promote leakage.

The bid price equations introduced above would be modified as follows:

$$\text{Bid price in State A} = MC + P_A(R - R_A) = MC + P_AR - P_AR_A$$

$$\text{Bid price in State B} = MC + P_B(R - R_B) = MC + P_BR - P_BR_B$$

Where P_A and P_B are the carbon credit prices in State A and State B respectively. It can be seen that the lowest bid will be determined by whether $P_A(R - R_A)$ is greater than $P_B(R - R_B)$, which depends on both the relative carbon prices and the relative rate standards.

Nonetheless, the market administrator could still eliminate the market distortion created by the differences in emission rate standards by adding $P_A R_A$ to bids from State A and $P_B R_B$ to bids from State B. The merit prices would then become:

Merit price in State A = Bid price in State A + $P_A R_A$ = MC + $P_A R$

Merit price in State B = Bid price in State B + $P_B R_B$ = MC + $P_B R$

In this case the lowest bid will depend only on the relative carbon prices in the two states, which is the same result that would obtain if both states were independently complying with identical carbon pollution standards.

Note that the real time electricity market could still result in an incentive for leakage which conflicts with the ECO/ICO if the carbon price is lower in the state with a higher emission rate standard. This may seem likely, but a higher emission rate standard does not necessarily mean a more lax standard measured by marginal compliance cost. For example, West Virginia and Wyoming have among the highest emission rate standards, but also have among the highest marginal compliance costs in the absence of regional cooperation according to EPA's analysis. Similarly, Washington has the lowest emission rate standard and among the lowest marginal compliance costs. Looking across all states there is no readily apparent relationship between a state's emission rate standard and its marginal compliance cost in the results of EPA's modeling of its proposal.[22]

The only obvious solution to this issue is to encourage states to cooperate by, at a minimum, allowing interstate credit trading, which would equalize the carbon credit price among participating states. EPA could facilitate this by establishing a federal carbon credit exchange that states could opt into.

Role of market administrator

Under this approach to addressing market distortions from differences in state emission rate standards the market administrator adjusts the merit order based on the emission rate standard and carbon price identified by each state that participates in the market. The administrator does not actually collect or distribute a carbon fee. The electricity market price would be set by the original bid of the generator that clears the market based on its position in the adjusted merit order. All generators higher in the adjusted merit order would dispatch and receive the market-clearing price, regardless of their original bid.

[22] See, Brattle Group, *EPA's Proposed Clean Power Plan*, Policy Brief, June 2014.

This is an appropriate role for market administrators to play given their mandate to ensure that the electricity market operates efficiently within externally imposed constraints, which will include each participating state's emission rate standards when the Clean Power Plan goes into effect in 2020.

(2) Addressing Leakage Associated with New Fossil Generation

Many issues related to new build fossil generation are addressed with the ECO/ICO framework described above because the ECO/ICO is based on the rate standards of the trading partner states, not on the particular generation sources within the states. Nevertheless, significant potential remains for leakage due to shifting generation within a given state to new fossil plants if these plants are not accounted for correctly in state plans. This leakage potential exists for all states that adopt a mass standard and for many that may adopt a rate standard.

EPA addresses part of this issue as it pertains to states that adopt a mass standard in its Nov. 6 TSD providing guidance and requesting comment on methodologies for converting rate standards to mass-based equivalents. EPA should supplement this guidance with a requirement that states implementing a rate standard must all either (A) include New NGCC as a component of BSER in setting the rate standard and in demonstrations of compliance, or (B) exclude new NGCC from BSER both in setting the standard and in demonstrations of compliance. EPA should not allow states to elect to adopt one or the other of these options, because the resulting matrix of standards would result in significant opportunities for leakage, as we describe in Section B, below.

If EPA requires rate states to adopt option A, states adopting a mass standard should also be required to include new NGCC in the same manner. If EPA requires rate states to adopt option B, states adopting a mass standard may be provided the option of adopting either of EPA's proposed mass standard calculation methodologies without creating the potential for significant leakage.

(A) Preventing Leakage from New NGCC in Mass Standard States

In the Nov. 6 TSD, EPA proposes two methods for converting rate standards to an environmentally equivalent mass standard. Because both methods provide an internally consistent treatment of both generation and emissions from new NGCC units, either method provides an acceptable means of preventing leakage from inconsistent accounting for new NGCC in mass states. Note, however, that both methods presume imports and exports remain constant at 2012 levels, reinforcing the need for EPA to require states to address leakage regardless of what form of standard the state adopts.

The first method EPA proposes applies the emissions rate target to each state's 2012 affected megawatt-hours under the rule. ("Method 1") This method does not allow for emissions to increase from these affected sources as a result of load growth, with new fossil sources that come online subject only to the New Source Performance Standards under section 111b of the Clean Air Act.

The second method applies the emissions rate to the sum of the megawatt-hours from 2012 affected generation and projected incremental load growth. ("Method 2") This method includes both generation and emissions from new fossil sources in establishing the standard and in demonstrations of compliance.

EPA has indicated in the *Preamble* that "Under a mass-based plan *where an emission limit on affected EGUs would assure achievement of the required level of emission performance in the state plan*, any emission reductions at affected EGUs resulting from substitution of new NGCC generation for higher-emitting generation by existing affected EGUs would automatically be reflected in mass emission reductions from affected EGUs."[23] But unless EPA requires states that adopt a mass standard to correctly account for the existence of new NGCC generation, the emission limit may not actually assure achievement of the required level of performance. Either of the proposed methodologies would begin to address this problem.

These approaches appear to presume that setting the standard in either manner will achieve the required level of environmental performance in part because new NGCC generation is expected to displace more carbon-intensive generation, thereby reducing overall emissions. In aggregate, the emissions reductions under either approach would be approximately equivalent to the predicted reductions under the rate standards analyzed in the Regulatory Impact Assessment that accompanies the Proposal, which generally supports this position.

An approach like the ones EPA proposes is necessary because, in the absence of a methodology that accounts for new NGCC consistently when setting the standard and when states count emissions for the demonstration of compliance, new NGCC could create the opportunity to actually increase overall emissions. If the mass standard neither counts the emissions from new units towards the achievement of the standard nor adjusts to reflect the smaller overall load being served by existing units due to the construction of new units, significant leakage potential exists.

One way to address this type of leakage is to count emissions from both new and existing units against the total allocation in the mass standard, as EPA does in Method 2. An alternative would is to re-calculate the mass standard by excluding projected MWh generated by new sources from the MWh projected in determining the standard, as EPA does in Method 1.

[23] 79 Fed. Reg. 34,923 (Emphasis added).

Example 1: Mass Standard Reflects Only MWh from Existing Sources (Method 1)

In this alternative, the new and existing fleets could be treated as fully distinct from one another:

State A adopts a mass standard of 35 tons based on a 2012 Affected Source load of 70 MWh and a rate standard of 1000 lbs/MWh. This result would be environmentally equivalent to the proposed rate standard for existing sources, with existing sources achieving a performance equivalent to a rate standard of 1000 lbs/MWh and new sources subject to the new source performance standard.

By 2030, State A's load grows to 100 MWh, with the incremental 30 MWh served by new NGCC with an emissions rate of 850 lbs/MWh, producing an incremental 12.5 tons emissions.

On a system-wide basis, this method results in an overall performance of 47.75 tons, rather than 50 tons. If State A's rate standard were lower than 850 lbs/MWh, the level of overall performance would be somewhat worse than if A followed the other methodology offered by EPA, illustrated in Example 2.

Example 2: All Emissions Count Against the Standard (Method 2)

If State A adopts a mass standard based on projected load of 100 MWh and an intensity standard of 1000 lbs/MWh, the standard in 2030 is 50 tons. Suppose State A builds a new NGCC plant with an emissions rate of 850 lbs/MWh and derives 30 MWh from the plant.

If State A were not required to account for new gas in complying with its standard, the new plant would emit 12.75 tons CO2, and the remaining load could be met by existing sources that are still permitted to emit 50 tons. The combined sources would emit 62.75 tons from 100 MWh of generation, operating at an effective rate of 1,255 lbs/MWh. The existing sources would perform even worse, emitting 50 tons from 70 MWh of generation, performing at a rate of 1429 lbs/MWh. This manner of accounting would create a net increase in statewide emissions and would not be environmentally equivalent to meeting a rate standard of 1000 lbs/MWh for existing sources.

If the emissions from the new build are counted against the standard, the remaining 70 MWh must emit no more than 37.25 tons, meeting

> an average emissions rate of 1064 lbs/MWh for existing sources. Averaging the existing sources with the new build, the combined emissions rate is 1000 lbs/MWh, producing an environmentally equivalent outcome to the proposed rate standard, when the combined fleet is considered.

The outcome of either Example 1 or Example 2 (with the appropriate method of accounting for new NGCC) is permissible from the standpoint of maintaining equivalent performance. Nevertheless, several potential pitfalls remain.

First, states that adopt Method 1 may choose to preferentially dispatch new sources rather than existing sources. If this preferential dispatch results in emissions beyond those that would otherwise be associated with the projected incremental load, leakage occurs. In an extreme case, a new NGCC unit may replace an existing NGCC unit, with no emissions reductions occurring at all while the state claims credit for reductions equal to the emissions of the retired plant.

Example 1 is equivalent to EPA's Method 1 only if none of the new generation that serves incremental load displaces 2012 affected generation. I.e., if State A's 2012 affected resources generated only 70 MWh, the mass standard under Method 1 would be 35 tons. But if incremental load is 30 MWh, and State A builds a new NGCC unit that provides 50 MWh while curtailing some 2012 resources, emissions from those 2012 resources could still reach 35 tons if the standard is not adjusted accordingly. Meanwhile, the new resources would emit 21.25 tons, for total emissions of 56.25. In this scenario, the state has not achieved equivalent environmental performance, and produced 6.25 tons leakage.

For this reason, EPA's Method 1 should contain a mechanism that adjusts the standard based on net MWh reductions from 2012 affected sources that are replaced by MWh from new fossil generation.

(B) <u>Preventing Leakage from New NGCC in Rate Standard States</u>

Leakage can also result from improper accounting for new NGCC in states that adopt a rate standard. A state that adopts a mass standard behaves for leakage purposes as if it were a state with a rate standard of zero lbs/MWh. As a result, similar leakage potential exists for states that adopt a rate standard, if to a somewhat lesser degree. The potential leakage is particularly high for states with the lowest and highest rate standards. EPA has requested comment on how best to address new NGCC for states that adopt a rate standard.[24]

Environmental performance would be hindered in states with high rate standards if these states have the option to include both the generation and emissions from new fossil units when making a demonstration of compliance with the rate standard. If

[24] 79 Fed. Reg. 34,924.

states with high rates have this option, they will have an incentive to build more new NGCC than is needed to serve statewide load, and export the surplus to states that have low rate standards or a have adopted a mass standard. However, this potential would be significantly reduced or eliminated if EPA requires all states to account for leakage caused by incremental imports or exports, as we recommend above. Provided that import/export leakage is sufficiently addressed, therefore, EPA could require all states to count all generation and emissions from new NGCC towards their demonstration of compliance without creating the potential for significant leakage.

Example 1: Leakage from New NGCC in High Rate State

Suppose State A has an existing fossil fleet that operates at an average of 2000 lbs/MWh and a 2012 load of 75 MWh. If State A has a 2030 load of 100 MWh and a rate standard of 1500 lbs/MWh, 2030 emissions would be 150,000 lbs.

If A is able to count all new NGCC towards the achievement of its emissions rate, the state could continue to operate its existing fleet unchanged, and build enough new NGCC to provide 75 MWh at a rate of 1000 lbs/MWh to achieve an average emissions rate of 1500 lbs/MWh, as required. In this case, total emissions are 225,000 lbs: 75,000 lbs higher than would constitute equivalent performance with the BSER.

However, if State A builds its way to compliance in this manner, it will produce 50 MWh electricity more than it needs. If this electricity is exported to neighboring states, some or all of these emissions could be accounted for and avoided through the ECO/ICO mechanism or other import/export leakage prevention measure.

If, on the other hand, State A builds only enough new NGCC to serve the incremental load by 2030 of 25 MWh, 2030 emissions are 175,000: 25,000 lbs higher than permitted for equivalent performance. But including this generation in the rate standard calculation results in a statewide rate of 1750 lbs/MWh. To achieve the rate standard of 1500 lbs/MWh, the state will need to reduce generation from its existing or new fleet at a rate sufficient to achieve the rate standard. Therefore no leakage is expected in this instance.

This methodology for addressing new sources in a rate standard is akin to EPA's Method 2 for converting a rate standard to a mass standard. In order to maintain consistency among states, if EPA requires rate states to include new NGCC generation and emissions in achieving compliance with a rate standard, it should also require states that adopt a mass standard to follow Method 2. EPA should also include projected new NGCC as a component of BSER when calculating states' rate standards, as the agency has proposed in its Oct. 28 NODA.

While requiring all states to account for emissions from new NGCC could be an effective way to reduce leakage, States that have rate standards lower than the emissions rate of a new NGCC plant may prefer to exclude generation and emissions from new NGCC in their demonstration of performance. If all rate states follow the same rule, whether new NGCC is included or excluded from demonstrations of compliance, no leakage is expected to occur on a national level.

If EPA elects instead to require rate states to exclude new NGCC generation and emissions from demonstrations of compliance, states with power sectors dominated by coal generation can still readily achieve their rate targets through measures such as those described in Building Blocks 1, 3, and 4 of BSER, they will also have the incentive to shift generation from existing sources to new sources in order to maximize the effect of these measures on the overall emissions rate. In order to minimize this incentive, in the event EPA requires states to exclude new NGCC from rate calculations, states should be permitted to adopt a mass standard based on either translation Method 1 or Method 2.

In this manner, the requirement that all states adopt a uniform methodology for the treatment of new NGCC under a rate standard will help to ensure that state plans achieve equivalent stringency with BSER. On the other hand, if states with high rate standards and low rate standards are individually permitted to elect to include or exclude new NGCC, significant leakage may result.

Example 2: Leakage Caused by Inconsistent Treatment of New NGCC in Rate States

Suppose State A is as described in Example 1 and that State B adopts a rate standard of 500 lbs/MWh. State B's 2012 fossil fleet has an emissions rate of 750 lbs/MWh and served a load of 75 MWh. State B's 2030 load is 100 MWh, resulting in total emissions of 50,000 lbs in 2030.

If both states achieve a level of performance equivalent to the BSER, State A will emit no more than 150,000 lbs and State B will emit no more than 50,000 lbs. Combined emissions should not exceed 200,000 lbs.

If each state is permitted to exercise its preferred choice:[25]

State A includes new NGCC, 2030 emissions are 150,000 lbs. State B excludes new NGCC, emitting 37,500 lbs from existing resources (75 MWh times 500 lbs/MWh) and 25,000 lbs from new resources for a total of 62,500 lbs in 2030. 12,500 pounds of leakage occur in State B.

If both states are required to include new NGCC:
No leakage occurs, as described in Example 1.

If both states are required to exclude new NGCC:

State A emits 137,500: 25 MWh new NGCC times 1000 lbs/MWh plus 75 MWh at the required rate of 1500 lbs/MWh. State B emits 62,500 lbs as described above. Combined emissions equal 200,000 lbs. While some leakage occurs in State B, it is offset by the improved environmental performance in State A.[26]

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[25] To see why these are the preferred choices, consider the following: In Example 2, State A's average emissions rate including all 2012 EGUs and 25 MWh of new NGCC is 1750 lbs/MWh – it has not yet achieved its rate target of 1500 lbs/MWh. Assuming new and existing resources are replaced in a manner that maintains a constant emissions rate of 1750 from these resources, State A would need to replace 14.3 MWh from this generation with zero-emission resources in order to achieve its target emissions rate of 1500. By contrast, if A excluded new NCGG generation and emissions from its demonstration of compliance, it would need to replace 18.75 MWh of its existing fleet with zero-emission resources. State A would therefore prefer to include new NGCC: including new NGCC requires the state to implement a smaller amount of new zero-carbon generation.

If State B includes new NGCC, B's 2030 emissions would be 81,250: 31,250 lbs more than would be equivalent to the BSER, and equivalent to a rate of 812.5 lbs/MWh – it is even further from its 2030 target than it was in 2012. To achieve the required rate of 500 lbs/MWh, State B would need to replace 38.5 MWh from this average fleet with zero-emission resources. By contrast, if State B is permitted to exclude the new NGCC MWh and emissions, it would only need to replace 25 MWh of its existing fleet with zero emissions resources. State B would therefore prefer to exclude the new NGCC, again because this method requires the state to implement a smaller amount of new zero-carbon generation.

[26] States can balance the economic burdens associated with maintaining a no-leakage equilibrium like the one described in this example through credit trading or other forms of agreement among themselves.

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As these examples illustrate, and as is borne out by our more detailed analysis, leakage potential exists where states may elect to include or exclude new NGCC from demonstrations of compliance with a rate standard. A rule that either requires all states to include new NGCC or to exclude new NGCC from demonstrations of compliance will eliminate leakage on a national level, assuming that import/export leakage is also prevented.

However, a rule that requires all states to exclude new NGCC would allow leakage to occur in states with the lowest emissions rate targets. Providing these states with a mass-based backstop on their rate standards could eliminate this leakage potential.

To maintain consistency among all states, whether they adopt a mass standard or a rate standard EPA should either:

A) Require all rate states to include new NGCC generation and emissions in their demonstration of compliance *and* require all mass states to count emissions from new NGCC against their mass standard; **or**
B) Require all rate states to exclude new NGCC generation and emissions from their demonstration of compliance. In this case, mass states may be permitted to adopt a standard that excludes generation from new NGCC from contributing to the load used to determine the standard, or one that includes this new NGCC generation in both determining the standard and in the demonstration of compliance.

In either case, EPA should also require all states to take adequate steps to prevent or correct for leakage caused by incremental imports or exports.