SIMPLIFYING ENERGY EFFICIENCY FOR STATES

Utilizing and Incentivizing Energy Efficiency-Related Greenhouse Gas Reductions under the Clean Power Plan's Mass-Based Approach

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Executive Summary

PROBLEM STATEMENT

As proposed, the mass-based approach in EPA's Clean Power Plan (CPP) creates a dis-equilibrium in the treatment of energy efficiency as compared with a rate-based approach. In a rate-based system, energy efficiency projects may be used to generate emission rate credits (ERCs), which power plant owners will need to acquire for compliance with the CPP. The ability to create ERCs – just as other low- or zero-emission power resources can – will allow efficiency projects to compete for investment aimed at reducing electricity sector carbon dioxide (CO_2) emissions in a rate-based state.

No equivalent means exists for enabling energy efficiency participation in the EPA's proposed mass-based approach. Unlike CO_2 reductions from heat rate improvements or the use of renewable generation, investors in efficiency projects would "share" the value of the CO_2 reduction with all regulated entities supplying power to the grid, rather than realizing the full value of those reductions themselves. In a mass-based system, energy efficiency projects will produce CO_2 reductions that benefit the compliance efforts of all electric generating units (EGUs) on that regional grid. However, the cost of those reductions would be entirely borne by the entity implementing the efficiency project. This is a classic free-rider economic impediment.

The absence of a mechanism for directly crediting energy efficiency projects in a mass-based system will effectively exclude efficiency investments as an economically reasonable CPP compliance strategy. Thus, costlier compliance options will be used instead – artificially increasing the costs to society of achieving the CO_2 emissions reductions required by the CPP.

OVERVIEW

- This paper presents two options for managing allocation of allowances in a mass-based system under the CPP.
- Either approach will enable energy efficiency projects to compete with other compliance strategies on fair economic terms – allowing the market to select the most appropriate balance of clean generation and energy efficiency.
- Unless allowances are allocated in a manner that directly recognizes CO_2 emission reductions from efficiency projects, the mass-based pathway will create an inherent market bias against using energy efficiency for CPP compliance.
- The currency for compliance in a mass-based pathway is emission allowances issued by EPA or a state.
- This paper recommends allocation of allowances directly to registered energy efficiency projects based upon the verified CO_2 emissions avoided by the project.
- The first approach described in this paper would replace – and improve upon – a "set-aside" of allowances for efficiency projects by ensuring that all registered and verified efficiency savings are allocated allowances. This approach can be extended to include renewable energy and other zero-emission technologies.
- The second approach would enable emission reductions from all zero-CO_2 emitting electricity resources (including verified energy efficiency projects) to be fairly recognized through an "output-based" distribution of allowances.
- Either approach would exactly match allowance allocations to the tons of CO_2 emissions avoided by energy efficiency projects – no more and no less – and ensure that all allowances distributed to efficiency projects are available to be used by EGUs for compliance purposes.
- This approach would recognize all (ratepayer or private sector) investments in energy efficiency on equal terms and ensure that treatment of efficiency in a mass-based system is on par with treatment of efficiency in a rate-based system under the CPP.

HOW EITHER PROPOSED ALLOCATION SYSTEM WOULD WORK

- To be eligible for allocations of allowances, a project would have to be registered in an accredited project registry that has appropriate requirements for measurement and verification (M&V) of energy efficiency measures implemented, and appropriate protocols for auditing the M&V of registered projects.
- The registries would be used to identify the quantity of CO_2 emissions avoided by energy efficiency projects in a given state.
- Allocations would be made to energy efficiency projects in exact proportion to the CO_2 emissions avoided since the last allocation of allowances by energy efficiency measures.
- In the event that the entity responsible for the energy efficiency project (the recipient of allowances) does not need the allowances for its own compliance, the allocations can be sold or transferred to any regulated entity.

BENEFITS OF THE ALLOCATION APPROACHES PROPOSED IN THIS PAPER

- Effectively incorporating energy efficiency can be a highly cost-effective option for reducing CO_2 emissions associated with the power system.
- Increasing reliance on energy efficiency projects can:
    - Reduce CPP compliance costs,
    - Improve industrial competitiveness, and
    - Increase economic growth
    - Enhance opportunities for additional cost-effective power sector reductions in the post-2030 period
- Employing either allocation approach described in this paper would correct:
    - The dis-equilibrium between treatment of energy efficiency in a rate-based system and a mass-based system, and
    - The "tragedy of the commons" effect that would depress investment in energy efficiency in a mass-based system
- Implementing either of the allocation approaches described in this paper would be fairly straightforward and transparent
- Inclusion of energy efficiency in the manner described in this paper would be limited to measured and verified CO_2 reductions and would minimize the incentive for "leakage" which refers to the potential for replacing generation from existing sources regulated under a mass-based cap with generation from new sources not regulated under a cap for existing sources.

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Issue Statement: Differences in Energy Efficiency under Rate- and Mass-based Plans

> *Energy efficiency automatically "counts" toward compliance under a mass-based approach since it displaces fossil generation and emissions under the cap, freeing up allowances for emitting sources to trade. There is no limit on the use of energy efficiency programs and projects, and energy efficiency activities do not need to be approved as part of a state plan … States can further incentivize energy efficiency under mass-based approaches by allocating emission allowances for energy efficiency activities, including activities that occur prior to 2022.* **(Energy Efficiency in the Clean Power Plan Factsheet, U.S. Environmental Protection Agency, August, 2015)**

As proposed, the mass-based approach in EPA's Clean Power Plan (CPP) creates a dis-equilibrium in the treatment of energy efficiency as compared with a rate-based approach. In a rate-based system, energy efficiency projects may be used to generate emission rate credits (ERCs), which power plant owners will need to acquire for compliance with the CPP. The ability to create ERCs – just as other low- or zero-emission power resources can – will allow efficiency projects to compete for investment aimed at reducing electricity sector carbon dioxide (CO_2) emissions.

No equivalent means exist for enabling energy efficiency participation in the EPA's proposed mass-based approach. Unlike CO_2 reductions from heat rate improvements or the use of renewable generation, investors in efficiency projects would "share" the value of the CO_2 reduction with all regulated entities supplying power to the grid, rather than realizing the full value of those reductions themselves. In a mass-based system, energy efficiency projects will produce CO_2 reductions that benefit the compliance efforts of all electric generating units (EGUs) on that regional grid. However, the cost of those reductions would be entirely borne by the entity implementing the efficiency project. This is a classic free-rider economic impediment.

The absence of a mechanism for directly crediting energy efficiency projects in a mass-based system will effectively exclude efficiency investments as an economically reasonable CPP compliance strategy. Thus, costlier compliance options will be used instead – artificially increasing the costs to society of achieving the CO_2 emissions reductions required by the CPP.

Energy efficiency is a proven, low-cost means of reducing CO_2 and serves as an eligible means of compliance with the CPP. EPA has made clear that the agency is counting on CO_2 reductions from energy efficiency to contribute to the success of the CPP and to lower the overall cost of the program. If properly integrated in the trading markets that are expected to develop in complying with the CPP, energy efficiency would provide flexibility to delay or avoid significant capital outlays otherwise needed to meet declining CO_2 emission budgets. Through energy efficiency, potentially wasted electricity use can be cost-effectively redeployed to where it can address new or growing demands—thereby eliminating the need for investment in new generation.

Although EPA has made clear that energy efficiency "counts" as an appropriate form of CO_2 emission reduction under the CPP, it has only formalized how energy efficiency projects can do so under a rate-based approach, through the creation of ERCs. The agency has specifically stated that quantified and verified megawatt hours from energy efficiency measures can be used to generate ERCs. The ability to generate and sell ERCs under a rate-based plan provides energy efficiency projects with the opportunity to participate in compliance markets on equal economic terms with other CO_2 emission reduction strategies.

However, EPA has yet to propose a corresponding program for mass-based state plans, due perhaps to its initial conclusion that efficiency would "automatically" be incentivized under a mass-based plan. In fact, a mass-based pathway, in which emission allowances are the primary trading currency, is not likely to automatically encourage energy efficiency projects or enable the inclusion of emission reductions from energy efficiency projects in CPP compliance markets. Without a specific crediting and approval mechanism under the mass-based pathway, the ability to count efficiency-derived CO_2 reductions will not translate into meaningful demand for energy efficiency—even when it is the least expensive among various emission control options.

Under the CPP, an allowance gives a fossil-fuel fired electric generating unit permission to emit one ton of carbon dioxide. States (or EPA under a federal plan) will decide the manner in which allowances are allocated. As proposed in the CPP, energy efficiency projects will not automatically receive allowances in a mass-based state in the same way they can automatically generate ERCs in a rate-based state. Therefore, states will need to take action to ensure that emission reductions resulting from energy efficiency projects receive appropriate allowances. Without such action, the absence of allowances for energy efficiency projects will limit the role energy efficiency can play in a state's efforts to meet its mass-based CPP obligations.

The simple assumption that demand for energy efficiency will automatically materialize in a mass-based system overlooks crucial market realities.

1) Energy efficiency (or electricity demand reduction) is anathema to many obligated parties, who are typically in the business of producing and selling electricity and whose revenues may not be decoupled from generation throughput.
2) More than half of the investments made annually in energy efficiency in the U.S. do not directly involve any party obligated to comply with the CPP (e.g., industrial manufacturers, building owners, energy service companies (ESCOs), etc.).
3) While it is reasonable to assume that higher electricity rates will create additional demand for efficiency:
    a. EPA does not anticipate significant rate increases will be caused by the CPP.
    b. Significant rate increases are harmful to industrial productivity and competitiveness, and would likely create a backlash that could slow or stop implementation of the CPP.
    c. Increasing deployment of demand-side energy efficiency would create downward pressure on electricity rates – which would, in turn, undermine the demand for additional efficiency if the cost of electricity is the expected driver of demand.
4) Efficiency projects would reduce demand on the entire grid, and would not necessarily reduce the CO_2 emissions for the owner of an individual EGU. Absent a system in the CPP that enables one to directly monetize the CO_2 emission reduction value of efficiency investments, CO_2 reduction benefits resulting from efficiency <u>investments made by one EGU</u> owner would be <u>shared by all suppliers</u> to the grid.

Thus, given that:

- Energy consumers will not increase investment in efficiency projects for their <u>own</u> compliance needs because the CPP regulates generators, not consumers, and
- A significant share of obligated parties view energy efficiency as contrary to their business interests (i.e., selling more electricity), and so, will seek to minimize or avoid energy efficiency solutions as a means of reducing CO_2 emissions.

Therefore:

- A failure to award allowances to energy efficiency projects will create material obstacles limiting the role energy efficiency can play in meeting a state's mass-based CPP obligations, and

- The costs of compliance with the CPP will be needlessly increased as obligated parties opt for compliance strategies that often exclude efficiency even when it is the least-costly greenhouse gas (GHG) emission reduction option.

Concept

> *Using data from a registry, States will distribute allowances to each energy efficiency project in proportion to the verified CO_2 emission reductions attributable to that project since the last allocation of CPP allowances by that state.*

This paper offers two options that state regulators can use in a mass-based state plan to maximize the use of low-cost energy efficiency strategies for compliance with the CPP. The success of the CPP will depend upon states having clear, easy to use implementation options that produce CO_2 reductions at the lowest possible costs. Energy efficiency is widely recognized as a lower-cost option than many investment strategies for addressing supply and demand in electricity markets and provides numerous ancillary benefits, such as increasing the reliability of the power sector, reducing criteria pollutant emissions, strengthening the competitiveness of state economies, and creating diverse jobs in the energy supply chain. EPA and the states can adopt an approach that will enable energy efficiency derived emission reductions to receive allowances and to compete head-to-head with other CO_2 emission reduction solutions.

EPA provided states with broad discretion in determining how to allocate allowances in the CPP. States that want, or expect, energy efficiency to contribute to CPP compliance should allocate allowances directly to efficiency projects. This will enable CO_2 reductions from energy efficiency programs and projects to compete on equal market terms with other options for CPP compliance.
Allocations to energy efficiency projects should only be made to properly verified or contractually guaranteed CO_2 reductions. To enable this approach, states will need EPA or another entity to furnish a simple-to-use registry of energy efficiency projects and their associated CO_2 reductions.

States can award allowances directly to the entities responsible for those efficiency projects – and in exact proportion to the CO_2 reductions that have been achieved and verified. The recipients of those allowances can sell, trade, or (in the case of EGU owners) use them for compliance depending on their own needs.

An energy efficiency registry will allow states to ascertain all of the verified efficiency-related CO_2 reductions that have occurred in the state during the applicable compliance timeframe. This tool will allow states to view the sum total of registered energy efficiency projects as they make annual allocation decisions. A reliable energy efficiency registry can catalog verified CO_2 reductions for state and federal officials and is essential to any effort to simplify and encourage the use of efficiency-related CO_2 reductions for CPP compliance.

EPA has proposed that it might support or contribute to the development of a national energy efficiency project registry. Although a broad, national energy efficiency registry does not exist today, many of the fundamental elements for such a registry are already in place as a result of states' experience with renewable portfolio standards and renewable energy certificates (RECs) tracking. The proposed National Energy Efficiency Registry (NEER) project, being led by the State of Tennessee and funded by a Department of Energy grant could prove to be an extremely useful platform for this activity. We look forward to being actively engaged in the NEER development stakeholder process, and encourage EPA to participate as well. We will discuss the additional steps needed to ensure an energy efficiency registry is in place.

Option 1: Direct Allocation Process (in Lieu of a Set-Aside)

Registries *will provide accurate, verified accounting of CO_2 emission reductions from efficiency projects.*

States *will allocate allowances to registered efficiency projects based on valid emission certificates issued by the registry for each project.*

Overview

EPA has requested comment regarding the use of a "set-aside" of allowances to incentivize energy efficiency. Set-asides are problematic for two reasons. In the event that CO_2 emission reductions from delivered efficiency projects is greater than the quantity of allowances set-aside, efficiency projects will not be able to realize the full value of their contribution to compliance. Uncertainty regarding the benefit will inhibit energy efficiency investments. Secondly, in the event that delivered efficiency projects underperform relative to the set-aside of allowances, regulated entities will be deprived of appropriate certainty regarding the quantity of allowances available for their compliance purposes.

In lieu of a set-aside, states should include energy efficiency projects in the allocation process based on achieved, verified reductions. The allocation design described below envisions annual allowance allocation based upon a retroactive look at the results of energy efficiency efforts within a state that were recorded in an EPA-approved registry. Distribution of allowances is determined by the quantity of CO_2 reductions achieved by registered and verified energy efficiency projects since the state's previous allocation of allowances.

Allocation Formula

TAA – RVEE = TAAR

Where:

- TAA = *Total Allowances Available* for allocation by a state in an allocation period (1, 2, or 3 years). This sum would be the "emissions budget" issued by EPA applicable to the state.
- RVEE = Tons of CO_2 reduced, since the previous allocation by the state, by appropriately *Registered and Verified Energy Efficiency* projects in the state. A number of allowances equal to RVEE should be distributed/allocated directly to energy efficiency projects in proportion to the CO_2 reduction achieved by each project.
- TAAR = *Total Allowances Available Remaining* are those that remain available for allocation by a state in an allocation period after distributing allowances based on RVEE.

Figure 1: Illustrative Example Using the Formula in an Annual Allocation of Allowances

	2022	2023	2024	2025
Proposed Formula	10,000,000 (TAA) - 0 (RVEE) = 10,000,000 (TAAR)	9,500,000 (TAA) - 250,000 (RVEE) = 9,250,000 (TAAR)	9,000,000 (TAA) - 350,000 (RVEE) = 8,650,000 (TAAR)	8,500,000 (TAA) - 500,000 (RVEE) = 8,000,000 (TAAR)
TAA (Total Available Allowances) The same as the declining CPP annual emission cap for the state	State Annual Cap 10,000,000 tons CO_2 TAA = 10,000,000	State Annual Cap 9,500,000 tons CO_2 TAA = 9,500,000	State Annual Cap 9,000,000 tons CO_2 TAA = 9,000,000	State Annual Cap 8,500,000 tons CO_2 TAA = 8,500,000
CO2 Emission Reduction from energy efficiency Projects	250,000 tons of CO_2 emissions avoided attributable to registered EE projects	350,000 tons of CO_2 emissions avoided attributable to registered EE projects	500,000 tons of CO_2 emissions avoided attributable to registered EE projects	750,000 tons of CO_2 emissions avoided attributable to registered EE projects
RVEE (Measured and Verified Energy Efficiency) States will simply use the number available[1]	RVEE = Zero (Derived from pre-2022 CO_2 reductions from registered energy efficiency projects)	RVEE = 250,000 (Derived from 2022 CO_2 reductions from registered energy efficiency projects)	RVEE = 350,000 (Derived from 2023 CO_2 reductions from registered energy efficiency projects)	RVEE = 500,000 (Derived from 2024 CO_2 reductions from registered energy efficiency projects)
TAAR (Total Available Allowances Remaining) This represents TAA minus RVEE. TAAR can be allocated in any manner the state determines appropriate.[2]	10,000,000 allowances allocated to additional recipients per state formula TAAR = 10,000,000	9,250,000 allowances allocated to additional recipients per state formula TAAR = 9,250,000	8,650,000 allowances allocated to additional recipients per state formula TAAR = 8,650,000	8,000,000 allowances allocated to additional recipients per state formula TAAR = 8,000,000
Allowances EE Projects Can Sell to Obligated Parties	Zero	250,000	350,000	500,000

[1] RVEE is based on prior year energy efficiency related CO_2 emission reductions. For this illustration we will assume no registered energy efficiency for the prior year. A state has the option to recognize pre-2022 registered energy efficiency in its first allocation of allowances.

[2] EPA has not imposed any limitation on who states can designated to receive allowances. This proposed approach to allocation of allowances depends on that flexibility to provide allocations to energy efficiency suppliers, but in no way proposes to limit allocation to other potential recipients, or methods of allocation. TAAR would be allocated in the manner, and to the parties, that the state deemed appropriate.

Qualified Energy efficiency Projects

This allocation scheme can incorporate CO_2 emission reductions created by any type of properly verified energy efficiency project in an approved registry including:

- Energy Efficiency Measures (non-guaranteed): industrial energy efficiency, above-code building measures, utility-led or ratepayer energy efficiency programs, residential retrofits, demand-response, building codes, etc.
- Energy Efficiency Measures (guaranteed): energy efficiency measures that are contractually guaranteed, such as performance contracts (PC) issued by ESCOs
- Other: This approach might be effective for capturing the CO_2 emission reduction potential of other emission reduction strategies, including distributed- and utility-scale renewable energy. While this paper is focused on market drivers for electricity demand reduction, other entities can consider whether this approach would further increase access to low-cost CO_2 emission reductions if it were expanded to include distributed renewable generation.

Allocation Method

As illustrated in Figure 1, a state will allocate allowances at the beginning of each calendar year[3] in the compliance period to appropriately registered energy efficiency projects located in their state in direct proportion to the verified tons of CO_2 emission reductions achieved by each since the previous allocation of CPP allowances. Allocations are distributed based upon energy efficiency projects already registered and generating savings in the prior year. This retroactively-looking, forward distribution process guarantees that only projects generating recorded efficiency savings can receive allowances for their CO_2 reductions (see Figure 2). A state will allocate the remaining allowances to EGUs or other entities in accordance with its established procedures.

Figure 2: Allocation Chronology

Timing	Event	Description
2022	Initial Allocation	Allocations are made to each efficiency project based on CO_2 certificates in a registry generated by that project. Thus, states can choose to distribute allowances to early action projects (activities occurring prior to 2022).
2022 – and Thereafter	Market Participation	Project participants may sell allowances to regulated entities or use them for compliance if they have CPP compliance obligations
2023 – and Thereafter	Subsequent Allocations	Using the project registry, state officials can identify the CO_2 emissions reduction associated with efficiency projects in the state since its last allocation of allowances

[3] While states have the flexibility to allocate for 1, 2, or 3 year periods, this approach assumes that single-year allocations will be used. While there may be some administrative simplicity achieved by three-year allocations, annual allocations will enable states to more effectively incentivize CO_2 emission reductions by the lowest-cost options – including, in many cases, demand reduction.

ALLOCATION METHODS FOR SPECIAL CIRCUMSTANCES

States can also enhance and accelerate the contribution to CPP compliance made by energy efficiency projects by allocating allowances under special circumstances.

- Early Action Allocation: States could recognize any and all registered energy efficiency measures installed after 2012 (commencing operations on or after January 1, 2013) that still provide energy savings during the post-2022 compliance period. Such allocation would incentivize early action energy efficiency deployment, which would in turn reduce demand and ease the state's overall CPP compliance burden. States could choose to allocate allowances in 2022 (the first compliance year) to qualifying early action energy efficiency projects.

- Clean Energy Incentive Program Allocation (Optional): States may also opt to credit early action energy efficiency measures that have commenced construction in September 6, 2018. At this time, EPA envisions that energy efficiency projects deployed in low-income communities after that time could receive two allowances (one from the state matched by one from EPA) for each ton of CO_2 emissions avoided. States would allocate allowances in 2022 to qualifying CEIP projects.

Application to Renewable Energy

> *States using a mass-based approach may provide additional support for renewable energy through direct allocations of emission allowances to renewables … States also have the opportunity under a mass-based approach to reward early action through allowance allocation strategies, separate from, and in addition to, a state's opportunity to participate in the Clean Energy Incentive Program.* **(Renewable Energy in the Clean Power Plan Factsheet, U.S. Environmental Protection Agency, August 2015)**

As EPA has stated, states can choose to directly allocate allowances to renewable energy technologies. This paper supports extending this direct allocation approach to renewables, as well as other clean energy technologies, in the same manner as the method described for registered energy efficiency projects. States would be able to see all quantified and verified energy efficiency and renewable energy projects in a registry and make allocations accordingly.

Distributed Renewable Energy: Small-scale, "distributed" sources of renewable electricity generation are often decentralized and modular. Distributed generation (DG) technologies face similar challenges as energy efficiency, since they are non-obligated parties under the CPP that will ultimately benefit states in reaching their compliance goals.

Utility-scale Renewable Energy: Utility-scale renewable energy technologies, such as grid-connected solar, wind or biomass, are measured for the purposes of sales, in which the output is metered in real-time by revenue grade meters. These technologies could easily integrate into a project registry.

Option 2: An Output-Based Allocation Approach

EPA has requested comment on options for implementing an output-based allocation system for distributing allowances. An output-based allocation approach may be the simplest and most direct

means of creating a market incentive under the CPP to decarbonize the generation and use of electricity.

Proposed below is an output-based approach that would allocate allowances based on their contribution to the grid of all system resources – including energy efficiency – in relation to the CO_2 emissions associated with that resource. In this system, the addition of a kWh of renewable or nuclear electricity would be treated identically to any demand reduction from a properly measured and verified efficiency project. Fossil combustion electricity resources would receive allowances proportionally reduced to reflect the CO_2 emissions associated with the generation of that electricity.

OUTPUT-BASED ALLOCATION APPROACH AND FORMULAS

1) Calculate Allowance Rate for Registered and Verified Energy Efficiency Savings, Renewables, and Nuclear

$$EE, RE, Nuc\ Allowance\ rate\ per\ MWh = \left(\frac{Avg.Lbs.CO_2\ per\ MWh\ from\ state's\ fossil\ EGUs}{2000}\right)$$

Where:
EE, RE, Nuc Allowance rate = number of allowances allocated for each MWh of generation or savings
EE = registered and verified energy efficiency
RE = renewable energy
Nuc = nuclear energy

2) Calculate Allocation of Allowances to EE, RE, and Nuclear

$$Total\ allocation\ to\ EE, RE, Nuc = EE, RE, Nuc\ Allowance\ Rate * MWh\ of\ EE, RE, Nuc$$

3) Calculate the Total of Available Allowances Remaining

$$TAAR = TAA - Total\ allocation\ to\ EE, RE, Nuc$$

Where:
TAA = Total allowances available
TAAR = Total allowances available remaining (after allocation to EE, RE, Nuc)

4) Calculate Allocation of Allowances to Fossil EGUs

$$EGU\ Allowances = \left(\frac{\left(\frac{TAAR}{Ftons}\right) * Avg.Fossil\ Emission\ Rate}{emissions\ rate\ of\ fossil\ EGU}\right) * Tons\ emitted\ by\ individual\ EGU$$

Where:
F_{tons} = Gross tons of CO_2 emitted from fossil sources
Emission rate of fossil EGU is equal to the pounds of CO_2 per one MWh from an affected source.

As illustrated in Figure 3, allowances will be allocated to sources according to a four step process:

1. Calculate the allowance rate for registered and verified energy efficiency savings, renewables, and nuclear power by dividing the average pounds of carbon dioxide per megawatt hour from the states fossil EGUs by 2000 in order to express the number of tons per MWh. For example, an average of 1,500 lbs. CO_2/MWh from all fossil sources would equal an allowance rate of three-quarter allowances per MWh of energy efficiency, renewables, or nuclear power.

2. Multiply the allowance rate in step one by the aggregate MWh's from energy efficiency, renewables, and nuclear power in order to calculate how many allowances will be allocated to these sources. To ensure that they are fully and fairly credited for their role in avoiding CO_2 emissions, these zero-emission resources are given priority over fossil generation sources in the allocation process.
3. Calculate the total number of available allowance remaining by subtracting the allocation to energy efficiency, renewables, and nuclear power from the number of tons under the cap in that year.
4. Calculate the allocation of remaining allowances to fossil EGUs. Allocations to fossil EGUs are determined by comparing an EGU's proportion of its emissions against all fossil emissions and allocating remaining allowances in inverse proportion to CO_2 emissions. This creates a further incentive for the use of the most efficient, least-emitting fossil powered generation resources.

This output-based allocation approach has the virtue of rewarding lower emitting sources with allowances in greater proportion than higher emitting sources. This serves as a direct incentive to expand reliance on the least-emitting resources and rewards the market actors that meet the largest electricity resource need while emitting the least CO_2. This should result in entities regulated under the CPP placing an increased premium on investments in low GHG electricity resources in order to secure sufficient allocations to offset emissions from their fossil-fired assets.

Figure 3: Hypothetical State Illustration

Assumptions:
Mass-based cap of 66,000,000 tons

Generation, Savings, and Emissions by Source:
Coal = 40,000,000 MWh @ 2,250 lbs. CO_2/MWh = 45,000,000 tons of CO_2 emitted
NGCC = 60,000,000 MWH @ 1,000 lbs. CO_2/MWh = 30,000,000 tons of CO_2 emitted
RE = 20,000,000 MWh @ 0 lbs. CO_2/MWh = 0 tons of CO_2emitted
Nuclear = 20,000,000 MWh @ 0 lbs. CO_2/MWh = 0 tons of CO_2emitted
EE = 10,000,000 MWh @ 0 lbs. CO_2/MWh = 0 tons of CO_2emitted

Average fossil emission rate = 1,500 lbs. CO_2/MWh

Total = 150,000,000 MWh generated and avoided
= 75,000,000 tons of CO_2 emissions

Output Based Allocation Approach:

1) **Calculate allowances for Registered and Verified Energy Efficiency Savings, Renewables, and Nuclear**

$$Allowances\ per\ MWh = \left(\frac{1{,}500}{2{,}000}\right) = 0.75\ Allowances\ per\ MWh$$

2) **Calculate Allocation of Allowances to EE, RE, and Nuclear**

$$Allowances\ to\ EE, RE, Nuc = 0.75 * 50{,}000{,}000 = 37{,}500{,}000$$

3) **Calculate the Total of Available Allowances Remaining**

$$TAAR = 66{,}000{,}000 - 37{,}500{,}000 = 28{,}500{,}000$$

4) **Calculate Allocation of Allowances to Fossil EGUs**

$$EGU\ Allowances = \left(\frac{\left(\frac{28{,}500{,}000}{75{,}000{,}000}\right) * 1{,}500}{2{,}250}\right) * 45{,}000{,}000 = 11{,}400{,}000\ allowances\ for\ coal$$

$$EGU\ Allowances = \left(\frac{\left(\frac{28{,}500{,}000}{75{,}000{,}000}\right) * 1{,}500}{1{,}000}\right) * 30{,}000{,}000 = 17{,}100{,}000\ allowances\ for\ NGCC$$

Allocation Summary:

37,500,000 allowances for EE, RE, Nuclear
17,100,000 allowances for NGCC
11,400,000 allowances for Coal

66,000,000 total available allowances

In this scenario, a coal-fired power plant generating 3,000,000 MWh would receive:

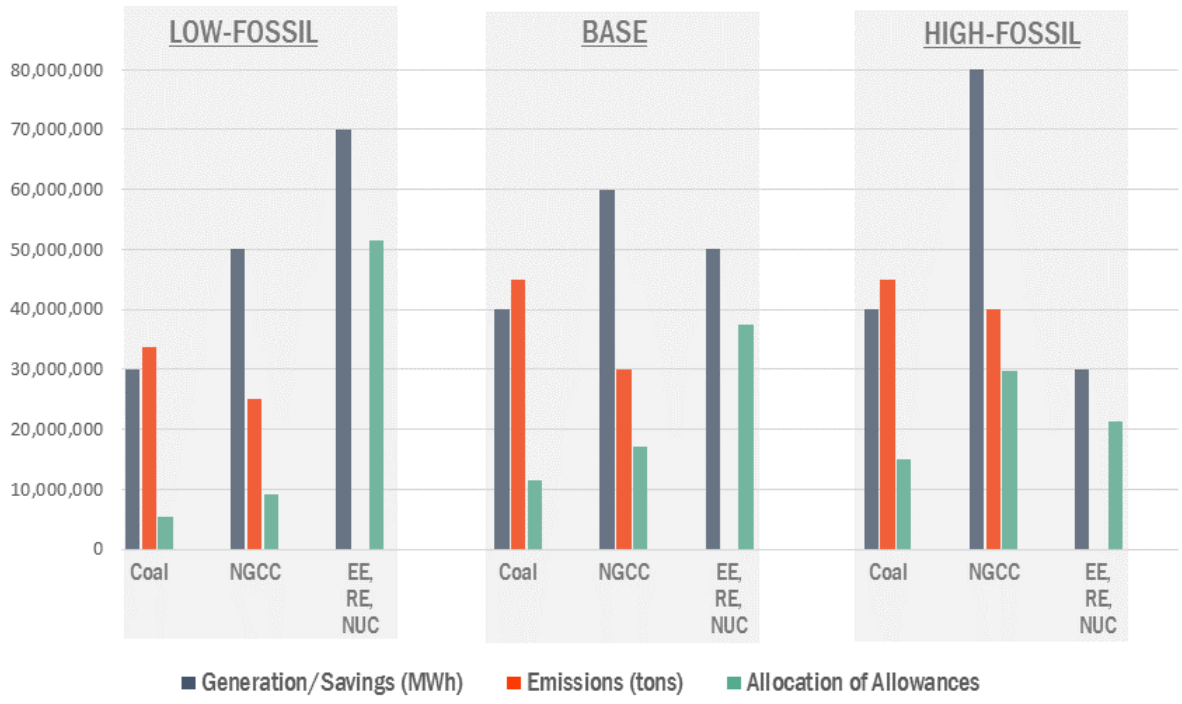
- 712,500 allowances if it were emitting at 2,400 lbs. CO_2 per MWh;
- 855,000 allowances if it were emitting at 2,250 lbs. CO_2 per MWh; or
- 1,005,883 allowances if it were emitting at 1,700 lbs. CO_2 per MWh

Figure 4 illustrates three allocation scenarios based upon the formula described above.

- The base scenario, described in full in the hypothetical state illustration in Table 1, describes how an allocation would occur in a state with a moderate balance between fossil and cleantech sources.
- The low fossil scenario assumes that less fossil sources and more energy efficiency, renewables, and nuclear power are used.
- The high fossil scenario reflects a greater reliance on natural gas for compliance.
- All three cases assume:
    - 150 million megawatt hours of power resources (total generated plus total demand avoided via EE)
    - 66 million ton CO_2 emissions cap
    - Emission rate for coal-fired units averages 2,250 lbs. CO_2/MWh
    - Emission rate for natural gas combined cycle units averages 1,000 lbs. CO_2/MWh

As shown in Figure 4, a state's allocation of allowances among sources is dictated by the composition of its net generation or savings and its gross emissions. The low-fossil scenario, which attributes 20 million more MWh to EE, RE, and nuclear (compared to the base case), results in nearly 17 million more allowances allocated to EE, RE, and Nuclear. These clean sources receive a higher proportion of allowances than coal and NGCC. In low-fossil states, allowances to clean sources outpace the linear progression of generation, so much so that the low-fossil state in this scenario will have surplus allowances, which it can sell to other fossil sources in need. Contrast this with the high-fossil scenario, where natural gas units receive more allowances than EE, RE, and nuclear, but at a proportionally lower rate than EE, RE, and nuclear. This is an output-based allocation approach that incentivizes and rewards investment in cleaner sources with allowances that can be used to reduce the cost of compliance with the CPP, and may even become its own profit center.

Figure 4: Output-Based Allocation Scenarios



Benefits

Each of these allocation approaches enables energy efficiency to compete on equal terms with other compliance options.

Overview

The allocation approaches proposed in this paper would enable energy efficiency to participate directly in competitive CPP compliance markets.

If conducted in the manner suggested by this paper, an allocation to clean sources would be simple for states to implement. With revenue generated through the sale of allowances, energy efficiency projects would have a clear opportunity to achieve shorter payback periods, which would make them increasingly attractive to private and public sector energy consumers. Given the large, well-documented, reserve of untapped efficiency opportunities in the nation's built environment, this approach may well enable a more rapid and less expensive path for CPP compliance by all parties than EPA currently anticipates – achieving even more ambitious future targets than conceived for decarbonizing the electricity sector post 2030.

Implementation Benefits of The Proposed Allocation Approach

The approaches described in this paper provides a simple and straightforward method for states to incorporate energy efficiency projects into their CPP implementation efforts. In addition, these approaches reduce uncertainty surrounding set-asides and other mechanisms that approximate future CO_2 reductions from efficiency projects.[4]

- Corrects the "Tragedy of the Commons" Error – In EPA's proposed mass-based allocation approach, investments in energy efficiency benefit all entities that supply the grid in a given region. This reality results in a significant dis-incentive for private sector energy efficiency investments to be included in CPP implementation activities. Either of the allocation approaches described in this paper would enable the CO_2 emission reduction value of any energy efficiency investment be fully and fairly realized by the entity that made the investment.

- Corrects the Dis-equilibrium between Mass- and Rate-based Approaches – The EPA describes how energy efficiency can participate directly in the market for CPP compliance options via the creation of ERCs. The allocation options described in this paper provide roughly equivalent approaches to enable energy efficiency to participate in the market for compliance under a mass-based approach.

- Simple to Implement – State regulators will face myriad challenges in implementing the CPP. The opportunity to harness market forces via CPP allowance trading mechanisms that encourage energy efficiency deployment would greatly ease this burden and reduce compliance costs. Furthermore, the approaches outlined in this paper provide simplicity, clarity, and certainty for states and regulators. The approach would create a simple two-step process for states: 1) use the energy efficiency registry to determine the amount of eligible CO_2 emission reduction delivered by registered projects; and 2) distribute the appropriate amount of allowances to those projects.

[4] While the CPP values the GHG reductions associated with avoided electricity consumption, many TPDEE projects include other environmental benefits, such as on-site fossil fuel savings and reduction in water consumption. By increasing the market signal for electricity avoidance, states will gain the environmental (including CO_2) benefits of non-electricity savings for no additional cost.

- Utilizes Only Verified CO_2 Reductions — Allowances are only distributed based on implemented energy efficiency measures for which the CO_2 emission reductions have been documented and verified.

- Allows Markets to Choose Energy Efficiency as a Compliance Option – Allocation of CPP allowances to efficiency projects will enable efficiency-derived CO_2 emission reductions to compete on equal terms with other CPP compliance options.

MARKET BENEFITS OF THE PROPOSED ALLOCATION APPROACH

- Low Cost Compliance: Energy efficiency is a low-cost, abundant GHG abatement resource. EPA estimates that efficiency projects can spur a 7% reduction in electricity demand by 2030, reducing electricity bills by $7/month on average for families and businesses across the nation. EPA's CPP rule gives states the opportunity to design "trading ready" plans in order to participate market-based emission trading programs. Energy efficiency's direct participation in these trading programs has the potential to drive down compliance costs and increase flexibility.
- Supports Economic Growth: Energy efficiency provides many public benefits in addition to reducing GHGs. Increased utilization of energy efficiency measures creates jobs across the manufacturing, construction, financial, environmental, energy, and technological supply chains. Additionally, by reducing wasteful energy expenditures, facilities as diverse as hospitals and manufacturing facilities can become more cost-effective, making them more competitive and increasing their ability to sustain and increase budget resources available to hire and retain employees.
- Increases CPP Compliance Flexibility: Energy efficiency can operate effectively in a mass-based approach. While EPA did not include energy efficiency as a building block in its goal-setting process, it unequivocally encourages and supports the use of energy efficiency in state plans. Under a mass-based approach, there is no limit on the use of energy efficiency projects and programs, and energy efficiency activities would not become federally enforceable as part of a state's plan.
- Allocation System Reinforces the Goals of the Clean Power Plan: This ambitious new regulatory program may be complex, but its simple purpose is to move the cost of electricity-related CO_2 emissions from society at-large to the electricity market. By awarding allowances to zero-emission electricity resources, regulators would set in motion a clear market incentive that rewards the largest use of the least expensive CO_2 avoidance strategies and technologies. This approach will maximize the internalization of CO_2 emission costs, and therefore create market forces that accelerate emission reductions.

Expected Market Response

A clear price signal and an open, transparent market for all power-sector CO_2 emission reductions will produce the most cost-effective CO_2 emission reduction strategies.

The majority of energy efficiency investments made in this country are made by organizations and entities that do not own or operate EGUs and, therefore, will have no compliance obligation under the CPP. Direct allocation of allowances to efficiency projects that deliver GHG emission reductions will

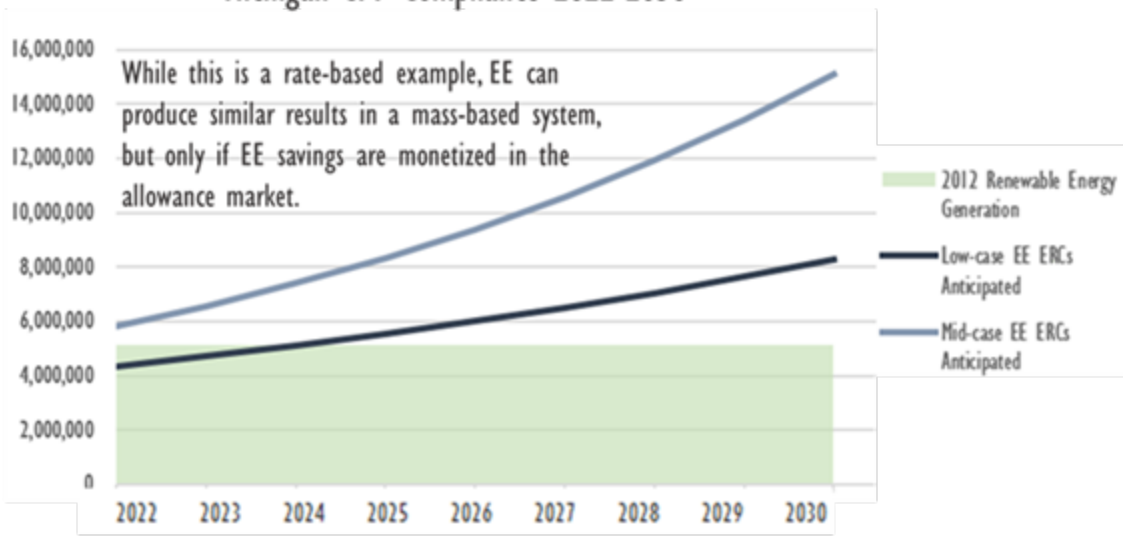
enable those projects to compete directly through allowance markets to provide low-cost CO_2 emission reductions.

The Acid Rain Program provides a compelling example of the benefits of allowing all compliance options, including energy efficiency, to participate directly in allowance markets. Some of the most cost-effective compliance in that program came – unexpectedly – through fuel switching to lower-sulfur coal resources. A scenario in which EGUs were only allowed to trade when surpluses were the result of installed post-combustion control technologies, but not when the surplus was created by fuel switching, would have been much costlier. Thus, the most broadly cost-effective strategy for reducing sulfur emissions played a much more significant role in compliance.

In many cases under the CPP, the lowest-cost compliance options will not translate into the compliance option that does the most to support corporate profitability. Obligated parties may have clear incentives to opt for more profitable but more expensive compliance options (e.g., increasing output from lower-GHG generating resources) over less expensive demand reduction options. While this would have no negative environmental impact (tons of emissions would be reduced either way), the greater cost would put the interests of corporate shareholders over those of ratepayers.

If energy efficiency is to play a substantial role in GHG emission reductions achieved under the CPP (as is illustrated in Figure 5), it is necessary for EPA and states to provide a clear and reasonable means of allowing proponents that develop and operate energy efficiency measures, but do not have CPP compliance obligations, to participate directly in the CPP allowance market.

Figure 5: EE's (Conservative) Potential Contribution to Michigan CPP Compliance 2022-2030



EE ERCs Generated as a % of Total ERCs Needed by Michigan Coal Plants to Achieve CPP Compliance

% of Needed ERCs	2022	2023	2024	2025	2026	2027	2028	2029	2030
Low Case Scenario	23%	21%	19%	19%	18%	18%	18%	18%	18%
Mid Case Scenario	30%	30%	27%	28%	29%	29%	30%	31%	32%

Market response (measured by increased investment in energy efficiency measures) will be driven by the value provided through the allocation of allowances. As the market demand and prices for allowances become clearer over time, large-scale efficiency projects will be able to estimate additional project value tied to allowances. A relatively strong and stable allowance price will shorten payback periods for efficiency projects and would lead to increased adoption of efficiency measures. Allowance prices that translate to $0.01 to $0.02 per avoided kWh would likely drive significant, sustained growth in market uptake for efficiency projects.

States Can Use Existing Program Elements

This allocation approach can enhance and leverage existing state energy efficiency programs.

States with existing programs aimed at increasing deployment of energy efficiency measures would see even greater results from those investments and activities and would not have to modify any existing programs or incentives in order for efficiency projects to be eligible to receive allowances. This includes traditional utility-led ratepayer or taxpayer-funded incentive programs, energy savings performance contracts, industrial efficiency programs, and above-code building efficiency incentives. Additionally, should a state choose to expand the scope or number of efficiency programs it uses, projects under those expanded programs would also be easily integrated in the allocation distribution system described in this paper.

For projects conducted under any state efficiency program to be eligible to earn allowances, each project would have to be registered and its performance appropriately measured and verified. The responsibility for these actions would fall to the project participants – not state officials. State officials implementing the CPP would be required only to make information available to project implementers regarding their intent to distribute allowances to registered and verified efficiency projects.

Additional Program Elements

States will need additional tools (e.g. a registry) to facilitate implementation of state plans.

State officials seeking to implement the approach described in this paper will not need to develop additional tools for managing their energy efficiency programs. They will, however, need additional tools to be developed and made available to them by EPA or other collaborating organizations. In some cases, (e.g. a registry) these additional tools will support more than demand reduction. In other cases, (e.g. approving M&V protocols) they will be more limited in scope. That said, the approaches described in this paper are far more straightforward for states to implement than several rate-based approaches currently under discussion.

In order to ensure that accurate information regarding efficiency-related CO_2 emission reductions is readily available to state officials, a few additional program elements need to be put in place. The most important of these is a registry of verified energy efficiency projects, such as the NEER project mentioned above and already in development. EPA indicated in its proposed Federal Plan that it would consider facilitating the development of a national project registry for this purpose. EPA can and should utilize and encourage third party efforts to develop a national project registry for CPP.

In order for a project registry to facilitate interactions between energy efficiency projects and CPP compliance, the CO_2 emission reductions associated with a project would have to be measured and verified according to widely accepted measurement and verification (M&V) protocols. Internationally-recognized M&V protocols exist and are in common use for energy efficiency projects listed in this paper. It will be necessary for a project registry to clearly establish the methods of M&V implementation and documentation that will be needed to participate in the registry.

- Appropriate M&V Methodology – M&V methodology varies by necessity depending on the type of energy efficiency program or project that is being verified. Residential appliance replacement incentives, whole-campus performance contract projects, and industrial process efficiency projects each have well-established, but unique M&V protocols. EPA has outlined how this can be achieved in the CPP rule and model plans. To provide meaningful support for energy efficiency projects under the CPP, any third-party registry must allow projects to use an accepted M&V protocol that is most appropriate given the nature of the project.

- Standardized Data – To facilitate effective auditing of M&V reports, while minimizing costs that could – if too high – eliminate any incentive for energy efficiency projects to participate in the registry process, the registry should establish and clearly articulate both the types of M&V data that will need to be reported and the format for that data to presented. It is costly and counterproductive for M&V data to be reconstructed and recalculated multiple times. This challenge can be addressed with clear guidance at the outset that allows all M&V professionals to prepare their data appropriately for this use.

- Audits – Maintaining confidence in the integrity of the data in an energy efficiency project registry is crucial if state officials are to rely upon that information for the purpose of determining the distribution of CPP allowances. It makes sense for the registry to utilize a process of random M&V report auditing. In the event that any deficiencies are found in a report, auditors should be authorized to investigate any additional projects associated with those participants.

- Liability – Organizations seeking to register projects in an energy efficiency registry should be required to adequately demonstrate that potential liability for any faulty claims of GHG emission reduction has been clearly assigned by binding contracts to an organization with sufficient financial resources and insurance to manage any future liability claims, to address financial penalties, and to secure additional GHG emission reductions as needed.

- Allowance and Tracking Compliance System (ATCS): Registry information will "feed" into the EPA ATCS system proposed in the Final Rule, allowing EPA and states to access energy efficiency project data. ATCS will serve as an emissions and allowance tracking system to record and track trading market and program data, including CO_2 emissions from regulated power plants and CO_2 allowance transactions among market participants. Each state's facilities and EGUs will have a registered account in the ATCS system that reflects their allowance transactions.

EPA and State Actions Needed

It will be necessary for the EPA to take several additional steps between now and the start of the CPP implementation period.

WE RECOMMEND THAT EPA:

- Include in the final Model State Plans and supporting materials an allowance allocation process along the lines of those proposed in this paper.
- Dedicate appropriate staff and financial resources to the implementation of an energy efficiency project registry as described above.
- Develop necessary guidance for states describing a process for allocating allowances with the purpose of incentivizing and recognizing the CO_2 emission reduction contributions from energy efficiency projects and programs.
- Provide states with appropriate support during the development of CPP implementation plans to enable the creation of clear and simple allocation procedures that will enable monetization of CO_2 emission reductions from energy efficiency projects.

WE RECOMMEND THAT STATES:

- Include in mass-based state plans an allowance allocation process along the lines of those proposed in this paper to enable the monetization of CO_2 reductions from energy efficiency projects.
- Recognize one or more EPA-accredited energy efficiency project registries as described in this paper to reduce state administrative costs to implement the CPP.