RESOURCES FOR THE FUTURE

Clean Energy Standards

Issue Brief 19-01 by **Kathryne Cleary**, **Karen Palmer**, and **Kevin Rennert** — January 2019

The Difficulty of Pricing Carbon

Pricing carbon—imposing a direct cost on each ton of greenhouse gas emissions emitted—is a policy tool favored by economists for its cost-efficiency in reducing emissions. In practice, policies to price carbon directly have proven difficult to put in place in the United States and elsewhere. Except for the Regional Greenhouse Gas Initiative, which caps emissions from electricity generators in nine northeastern states, and the AB32 cap-and-trade program in California, carbon pricing in the United States has yet to materialize. In the 2018 midterm elections, voters in Washington State rejected Ballot Initiative 1631, which would have established the nation's first carbon fee. This failure represents the second time in the past two years that Washington voters have rejected a carbon tax, highlighting the challenging politics of imposing a direct price on carbon even in one of the most progressive states in the nation.

In contrast, policies that promote renewable energy have been popular and widely implemented in states across the political spectrum. Nearly **three-quarters of US states** have adopted either a mandatory or a voluntary renewable portfolio standard (RPS), a traditional approach that requires (or encourages, in the case of voluntary programs) that a certain percentage of a utility's sales come from eligible renewable energy technologies (including wind, solar, and geothermal). Although the percentage requirements or targets vary substantially across states, the overall goals of such RPS policies are typically to deploy zero-carbon renewable resources, reduce emissions, diversify the energy mix, and provide an incentive to induce market entry of technologies with the potential to create new jobs.

By allowing renewable energy production to generate renewable energy credits (RECs) that can be traded, an RPS provides a market-based solution to meeting renewable energy deployment goals. However, the narrow technological focus of an RPS, combined with generally low renewable targets that limit their ability to displace emitting generation, can curb the effectiveness of the RPS as a tool to reduce greenhouse gas emissions. One way to enhance the ability of this more traditional approach to reduce emissions is to expand an RPS into a more inclusive clean energy standard.

What is a Clean Energy Standard?

A clean energy standard (CES), while lacking a universally accepted definition, typically refers to a technology-neutral portfolio standard that requires that a certain percentage of utility sales be met through "clean" zero- or low-carbon resources, such as renewables, nuclear energy, coal or natural gas fitted with carbon capture, and other technologies. As with an RPS, eligible technologies are awarded credits per MWh of generation that can be traded, which provides an efficient, market-based solution to meet a standard.

A CES offers the potential to achieve an equivalent level of emissions reductions as an RPS at lower cost. Having a greater number of technologies in competition to reduce emissions can increase market efficiency and lower overall compliance costs for a given level of emissions reduction. In addition, the inclusion of a broad range of zero- and low-emitting technologies as compliance options for a clean energy standard can also increase ambition with respect to emissions reductions. A technology-neutral CES coupled with a more stringent target could therefore result in both higher emissions reductions and lower costs relative to a traditional RPS.

Previous research done by **RFF** suggests that further efficiency gains are possible by using a credit system based on emissions rates rather than technology type. This credit system would encourage emissions reductions through changes in dispatch or investments at a facility, consequently further reducing emissions and lowering costs by allowing low-carbon technologies to participate. Under this construct, technologies would be compared on an emissions rate basis with a reference type of emitting generator, either a new coal plant or some type of natural gas plant, and would receive credits accordingly.[1] Plants that emit at an equivalent or higher rate than the baseline plant would receive zero credits, while those with an emissions rate less than the baseline can earn partial credit. This structure would bring a CES one step closer to providing incentives similar to those created by pricing carbon directly.

Economists generally agree that in theory, pricing carbon directly is a more cost-effective approach than a CES for reducing emissions. However, previous RFF **analysis** suggests that a CES can be a relatively more cost-effective approach when the labor and capital market effects of preexisting taxes on those inputs to production are taken into account and when the emissions reduction target is low. The reason is that other policies (carbon tax, cap-and-trade) can interact with existing taxes on labor and capital and raise the policy's cost, while a CES has no such interactions.

The changes that a CES will drive in power generation can be expected to affect electricity costs at both wholesale and retail levels. The magnitude of the effects will depend, among other factors, on the stringency of the policy target. The provision of credits to clean resources will likely create an incentive to expand energy supply and consequently lead to lower wholesale market prices. This effect notably differs from that of a carbon price, which would likely raise wholesale prices. The extent to which decreased wholesale market prices will lead to lower retail prices could vary with the policy target but would be especially likely when customers are served by a vertically integrated utility that generates more clean energy credits than it needs to comply with the standard. Conversely, as the target becomes more stringent and credit prices increase commensurately, retail prices would likely increase for electric utilities that are net purchasers of credits.

Previous Efforts on Clean Energy Standards

Past Federal Attempts

The idea of a national clean energy standard is not new, and the concept has received bipartisan support. In 2010, Senator Lindsey Graham (R-SC) sponsored the **Clean Energy Standard Act of 2010** which would have set a clean energy standard to 50 percent of electricity sales by 2050. Two years later, Senator Jeff Bingaman (D-NM) introduced the **Clean Energy Standard Act of 2012** (CESA 2012) to the Senate Committee on Energy and Natural Resources which would have set a federal clean energy standard at 24 percent of electric generation in 2015, rising 3 percent per year until reaching 84 percent in 2035. Similar to Sen. Graham's bill, the list of eligible technologies included all non-emitting sources (renewables and nuclear) and several low-emitting sources (e.g., natural gas, waste-to-energy, and fossil fuel generation with carbon capture and storage) placed in service after 1991. Unlike the Graham bill, CESA 2012 used emissions-based crediting for low-emitting sources relative to a baseline with an emissions rate of less than 0.82 metric tons of carbon dioxide (CO_2) per MWh.

Previous RFF **analysis** and congressional **testimony** provided at the time of the Bingaman bill's introduction found that it would have substantially reduced cumulative CO_2 emissions to 21 percent below 2005 levels by 2035 but also raised average electricity prices by 18 percent in 2035 relative to a baseline scenario. That analysis emphasized the emissions reduction potential from implementing a federal CES as well as the associated policy trade-offs of various design options with respect to overall costs and the distribution of those costs across the country.

Since 2012, the US energy market has undergone substantive changes that would likely reduce the compliance costs of implementing a CES structured similarly to CESA 2012 today. Costs for renewable energy and natural gas have dropped significantly in the past few years, and consequently these technologies have displaced higher-emissions coal plants based on market forces alone, even in the absence of a large-scale federal policy intervention. Given that the cost of compliance has decreased and the generation fleet

has become much cleaner since 2012, a federal CES today would likely require a much higher initial target to provide meaningful emissions reductions.

State Clean Energy Standards

Motivated by concerns about carbon emissions and nuclear plant retirements, several states have already implemented programs to promote multiple types of zero- or low-emitting generation in a spirit similar to the technology-neutral CES outlined above. Each of these state approaches differs from a comprehensive CES, however, in its tailoring of incentives to specific technologies, as well as in other important ways.

In New York, for example, policymakers established a zero emission credit (ZEC) program in 2016 alongside the state RPS to keep existing nuclear plants online. The program compensates nuclear plants at a fixed price[2] per MWh under a long-term contract until it expires in 2029. Illinois and New Jersey subsequently adopted similar approaches. New York named this new broader clean energy program (consisting of the RPS and ZEC programs) the "Clean Energy Standard" despite the lack of tradable credits or an established percentage target standard for nuclear generation. Compared with a technology-neutral CES that encourages competition, ZEC payments may result in higher payments to nuclear generators than would otherwise be seen in a tradable credit market.

Pennsylvania's Alternative Energy Portfolio Standard, originally enacted in 2004 and modified several times since, encourages both renewable resources, such as wind and solar, and nonrenewable resources, such as useful thermal energy and integrated gasification combined-cycle coal. However, unlike a comprehensive CES, the incentives for each of these categories are kept distinct: the standard has one tier for renewable energy and a second tier for "alternative" energy, with separate corresponding targets and associated credit markets. Compared with a technology-neutral CES, the separate incentives for different technology categories could limit the gains from efficiency provided by a single credit market. Also, Pennsylvania's definition of alternative technologies eligible for credit in tier two is broad and not limited to low-emitting sources: for example, it includes waste coal—a polluting and previously discarded form of low-energy coal. The Pennsylvania targets are set to a modest 8 percent and 10 percent of sales by 2020–21 for tiers one and two, respectively, and are therefore limited in their emissions reductions potential.

California has come closest to embracing a CES, albeit with a long implementation lag. In September 2018, the state passed **SB 100**, which requires that 100 percent of retail sales come from zero-carbon sources by 2045. Though SB 100 has been interpreted in popular media as requiring that California transition to 100 percent renewable energy, the new law more specifically states that 100 percent of electricity sales must come from "eligible renewable energy resources *and* zero-carbon resources," of which 60 percent of sales must be from renewable energy sources by 2030. The legislation itself does not define the zero-carbon sources that can be used to comply with the standard, as they will be defined in subsequent regulation to be developed by the state's public utilities commission. The 60 percent renewable target represents a substantial increase relative to the **29 percent of sales** that renewables represent currently. The requirement that such a high percentage of the overall goal come from renewables could potentially limit the cost-effectiveness of the policy relative to a technology-neutral CES without such a restriction.

If the sole goal of these state policies is to reduce carbon emissions, that goal could be achieved more efficiently by implementing a technology-neutral CES. To do so, a state would need to expand the list of technologies eligible to meet the standard and adjust the standard commensurately to ensure the same level of emissions reduction.

In practice, a policy's economic efficiency will depend on a host of design decisions, including technology coverage, treatment of existing generators, and cost constraints. All of these factors can influence the policy outcome in terms of emissions abatement, cost, and resource mix.

Policy Design Considerations

When designing a CES, policymakers encounter several tradeoffs and must consider the most appropriate option. Many of the considerations are relevant at both state and federal levels. Reports from **RFF** and

the **Center for Climate and Energy Solutions** (C2ES) provide a thorough review of the design options available for a CES. Significant decisions involve which technologies to include, how high to set the target (given the current level of renewable energy and other non-emitting generation), how to treat existing resources, and whether the standard should be technology or emissions-based, among others. We briefly describe various considerations and policy trade-offs below.

Technology-neutral vs. technology-specific. In designing a CES, policymakers must choose between minimizing costs by adopting a technology-neutral approach to crediting, based on a metric such as emissions intensity, and encouraging certain technologies. For example, some existing RPS targets include "carve-outs" or separate requirements for certain technologies to ensure that the standard is not met exclusively by the lowest-cost renewable energy. As a consequence, including carve-outs tends to raise the costs of the policy in the near term, but a carve-out may also help promote technological learning and thereby lower future costs for nascent technologies needed to comply with later years of the policy. A potentially lower-cost option would be to assign higher credits to nascent and therefore more expensive technologies (e.g., solar coupled with energy storage could receive twice the MWh credit provided to wind) that policymakers specifically want to encourage until the technology matures. However, assigning higher credits for particular technologies can reduce the stringency of the policy.

Crediting existing generators. A related consideration is how to address the crediting of existing zero-carbon generators. A reason to exclude existing technologies is that credit revenue may not affect their decision to operate in the future. This is likely the case for hydroelectric plants but not necessarily for nuclear plants that may be struggling to remain online. A recent **report** by the Union of Concerned Scientists reveals that more than one-third of the US nuclear fleet is either unprofitable or already scheduled for early retirement. The retirement of these nuclear generators could lead to an increase in carbon emissions, since they would likely be replaced with carbon-emitting natural gas plants. Under these economic conditions, policymakers could find that crediting existing generation could be necessary to keep zero-carbon generation online and prevent increases in emissions.

However, many other nuclear plants continue to operate without subsidies, and therefore crediting them unnecessarily could increase compliance costs and place an additional burden on consumers.

Cost containment. Policymakers must decide whether an alternative compliance payment (ACP), a payment that electricity retailers can make in lieu of having to surrender clean energy credits, is needed as a safety precaution to contain costs. Including an ACP could limit the emissions reduction potential of the policy.

Interaction with other policies. When designing a CES at the federal or state level, policymakers should consider possible interactions between existing policies. One potential interaction could be an existing state RPS (or CES if such a policy were implemented) with a federal CES. Since a CES is typically implemented at the utility level like an RPS, a federal policy will likely either override an existing state policy or allow the state policy to dominate (if it is stricter). The interaction of policies could also potentially lower allowance prices in the existing policy's territory.

Crediting for resources outside of the compliance region. Another important CES design choice is whether to credit clean generators located out of state or out of the country. Allowing resources from outside the compliance region to earn credits could help lower the costs of compliance but may also run counter to the desire of policymakers to drive economic development domestically or within a given state. However, excluding entities outside the compliance regions, particularly those that might sell power to load-serving entities with compliance obligations under the policy, may run afoul of the interstate commerce clause or trade agreements. This issue has led to legal battles in a few states over whether excluding out-of-state resources has violated the clause (see **here** for details). To avoid this issue, some states have chosen to allow resources from within their regional transmission jurisdiction to be eligible for compliance.

Additional Considerations for a Federal Standard

The above-mentioned considerations apply to the design of any CES, but even more trade-offs must be taken into account when constructing a national policy. A federal CES offers significant emissions reduction potential and could lower compliance costs relative to a collection of state policies by allowing trading among a greater number of resources over a much larger geographic area. However, this larger area comes with more extreme regional differences in existing energy fleets, available resources, and existing policies, all of which will need to be accounted for to create the political coalition necessary to support a national policy. The following considerations will likely be more consequential at the federal level.

Addressing regional "fairness." A particular challenge for federal CES legislation is concerns about the fairness of the policy. Some regions of the country have already aggressively pursued clean energy and boast abundant renewable resources while others have consistently relied on their own fossil fuels. Setting a single nationwide standard that some utilities can easily meet and others struggle to achieve could result in a wealth transfer from fossil fuel–rich states to cleaner states with an excess of clean energy above the standard. One proposed method to address such fairness concerns has been to require all regions to increase their clean generation by a certain percentage, rather than requiring a percentage of sales; however, this approach could limit the economic efficiency of the policy.

Treatment of small utilities. Another important policy consideration is the treatment of small utilities. Previously proposed federal RPS and CES legislation often exempted small utilities from compliance obligations. RFF **analysis** of Senator Bingaman's bill found that exempting small utilities in this manner had significant consequences: it caused retail electricity prices to differ by as much as 50 percent between exempt and nonexempt utilities by the year 2035, with exempt utilities having lower prices. The exemption offered the potential policy benefit of reducing regulatory burdens for small utilities that might not have the resources to alter their existing energy fleets, but the resulting imbalance in prices created inequity among electricity customers in different areas in the model runs. Such an exemption could also create an incentive for a proliferation of small utilities to qualify for it. Although this trade-off could also occur at the state level, the consequences are likely more pronounced on a national scale.

The Path Forward

Policymakers interested in reducing carbon emissions from the electricity sector in a cost-effective way could find that a CES is a viable alternative to putting a price on carbon. Though not a perfect instrument, it likely holds more political appeal than a carbon tax and could be tacked on to existing RPS programs. Implementation of a CES at either the state or federal level could have enormous potential to transform the electricity sector.

Consideration of a CES may be particularly relevant for some states with RPS policies that are phasing out over the next few years. Maryland, Missouri, Colorado, New Mexico, and South Carolina, for example, all have final RPS target years of 2021 or before. The approaching final target dates may prompt state lawmakers to revisit these policies and therefore could provide an opportunity to implement a clean energy standard instead of expanding an existing RPS.

Hawaii, on the other hand, is kicking its RPS into high gear with aggressive future targets, and more states may follow suit. The idea of "100 percent renewable energy" has political appeal for states with green agendas. But if the goal is zero-carbon generation, a technology-neutral CES is likely more economically efficient and could also help avoid the grid-related risks that come with relying exclusively on intermittent power (see **NREL** study).

At the federal level, despite notable and even bipartisan introductions of economy-wide climate policies over the past several years, the US Congress has not acted. However, the updated and stark predictions in reports by the **Intergovernmental Panel on Climate Change** (IPCC) and the **National Climate Assessment** have given climate change a new wave of national attention. Many new and incumbent Democrats have promised action on climate as they regain control of the House of Representatives for the first time in eight years. These

circumstances suggest that the 116th Congress is likely to provide a window of opportunity for developing and evaluating various approaches to climate legislation.

The technologies for and economics of power generation have changed significantly since the last time a CES was an active part of the policy conversation at the federal and state levels. Over the intervening years, economists' understanding of market-based policy mechanisms to reduce emissions has also continued to increase, aided in part by advances in the modeling tools available to evaluate such policies. In light of the windows of opportunity for policymakers at both the federal and state level to explore a CES policy, RFF experts are currently using RFF's state-of-the-art, highly detailed power sector models to evaluate a comprehensive set of policy options for a CES. Results from this analysis will be available in the coming weeks and months.

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Notes

1 E* is the baseline plant emissions rate and E' is the emissions rate of the plant in question. The credit is determined by the following equation: the maximum of zero or C = (E* – E') / E*. Plants that emit no carbon would receive a full credit ((E* – 0) / E* = 1). Those that have an emissions rate greater than E* earn zero credits while those with an emissions rate less than E* earn partial credit.

2 The ZEC value is based on the social cost of avoided carbon and changes in expected wholesale electricity prices and is adjusted every two years.