# FROM RPS TO CARBON: AN EVOLUTIONARY PROPOSAL

by C. Baird Brown and Robert B. McKinstry Jr.

*C. Baird Brown is the Principal of eco(n)law LLC. Robert B. McKinstry Jr. is the principal of Environmental and Climate Law & Consulting, a retired partner from Ballard Spahr, LLC, and a fellow of the American College of Environmental Lawyers and the American Bar Foundation.*

**SUMMARY**

**Renewable portfolio standards (RPS) and their accompanying renewable energy credits have been adopted by 38 states and the District of Columbia. This Article argues that they have outlived their usefulness, and proposes a transition to a "carbon reduction standard" (CRS) based on a statewide target for the average carbon emissions per megawatt hour of electricity generation. It describes in detail how a CRS would work, how it aligns with changing policy goals, and how it would take advantage of RPS lessons learned. Such a transition would avoid the unintended adverse consequences of RPS and better align the policy mechanism with the underlying environmental protection goals, particularly the goal of avoiding climate disruption.**

A renewable portfolio standard (RPS) has been adopted in some form by 38 states and the District of Columbia.[1] These laudable policy initiatives have now outlived their usefulness. We propose a transition to a carbon-based standard that will better serve the objective of avoiding the worst ravages of climate disruption, while preserving the value of existing renewable energy credits (RECs) and also avoiding disruption of existing contractual relationships.

The new standard, a "carbon reduction standard" (CRS) would be based on a statewide target for the average carbon emissions per megawatt hour (MWh) of electricity generation. The target average carbon emissions would be lowered by regular increments over time to achieve zero net carbon by a fixed date. Electric generating resources with emissions lower than the target average would be entitled to "carbon reduction credits" (CRCs) much as they are now entitled to RECs. Electric generating resources that exceed the target average would be required to purchase and retire CRCs, much as electricity sellers do now. This evolution is suggested principally by our changing understanding of the policy goals, but it also provides an opportunity to restructure the product, CRCs, to avoid some of the pitfalls of its predecessor.

## I. Background

RPS statutes were widely adopted across the county beginning in 2000,[2] as incentives to invest in renewable energy generation. They entitle the owner or operator of a generator using an approved renewable technology to receive one REC for each MWh of electricity generated and registered with the program. The RECs were modeled on "voluntary" RECs, which were being acquired by environmentally conscious individuals or institutions who wished to reduce their environmental footprint. For those who could not install their own renewable generation, they represented a way to purchase the "renewableness" separate from the actual power. The renewableness consisted of a bundle of some or all of the "environmental attributes,"[3] including greenhouse gas (GHG) reductions, nitrogen oxide and sulfur oxide allowances,[4] and the right to claim that a customer was using renewable electricity. In other words, it represented a mixture of inchoate environmental commodities and bragging rights.

Creating a tradable instrument (the RECs) was already a tried-and-true mechanism for incentivizing market

1. NC Clean Energy Technology Center Database of State Incentives for Renewables & Efficiency (DSIRE), *Summary Maps*, https://programs.dsireusa.org/system/program/maps (last visited July 7, 2020) (select "Renewables Portfolio Standard" in Program Type filter option drop-down list).

2. DSIRE, *Programs* (Renewables Portfolio Standard Summary Table), https://programs.dsireusa.org/system/program?type=38&category=2& (last visited July 7, 2020).

3. *See*, *e.g.*, Master Renewable Energy Certificate Purchase and Sale Agreement, prepared on behalf of the American Bar Association, the American Council on Renewable Energy, and the Environmental Markets Association, §1.27 (2007), https://emahq.org/sites/default/files/ABA%20EMA%20ACORE%20Master%20RECs%20Agreement%20v1.0.pdf.

4. DSIRE, *supra* note 2.

behavior.[5] In states where targets were set high enough, the resulting prices for RECs combined with the federal investment tax credit or production tax credit drove a substantial new industry for wind, solar, and other favored "renewable" electricity generation technologies.[6] However, creating a hybrid environmental commodity based on the voluntary market has had unintended consequences that, in some cases, can undermine the underlying environmental protection goals.

The CRS proposed in this Article allows a transition that avoids these adverse consequences and will better align the policy mechanism with the underlying environmental protection goals, particularly the goal of avoiding climate disruption. The Article describes in some detail how a CRS would work, how it aligns with changing policy goals, and how it would take advantage of RPS lessons learned.

## II. The Policy Goal Is Evolving

We propose a change in focus from technologies to GHG emissions. The proposal reflects both the urgent need to address the climate crisis we now clearly face, and also the significant changes in technology and market conditions from those existing when RPS programs were adopted. These programs, as originally conceived, sought to support the spread of solar, wind, biomass, and other renewable technologies. The programs made and still make no distinctions based on levels of efficiency or of carbon emissions of different fuels, such as nuclear, conventional large-scale hydroelectric, or even natural gas cogeneration as compared to a coal-fired stationary boiler. They also provide no long-term goals.

### A. The Urgency Is Greater

At the beginning of the century, there appeared to be time to gradually transition our economy to achieve the United Nations Framework Convention on Climate Change (UNFCCC) objective of preventing "dangerous anthropogenic interference with the climate system."[7] Promoting newer, non-emitting technologies as one of many tools to reduce GHG and other emissions made sense. However the United States, along with most other nations of the world, failed to implement measures of sufficient stringency to prevent continuing substantial increases in GHG emissions. Advancing science now informs us that room to procrastinate is gone.[8] The most recent report of the Intergovernmental Panel on Climate Change (IPCC) concludes that achieving this goal will require worldwide emissions to be reduced by 40% from 2010 levels by 2030 and to reach carbon neutrality by around 2050.[9] The enormity of the problem will require an "all of the above" approach.[10]

RPS programs are now insufficient to meet our decarbonization goals for several reasons. First, by picking some technologies, the RPS programs omit others that will likely be critical to achieving the decarbonization necessary to achieve net zero emissions by 2050. These omitted technologies include, most notably, nuclear power and carbon capture and sequestration (CCS) applied to combustion technologies, whether fossil fuel or biofuel,[11] as well as large-scale hydroelectric. Legislative efforts to keep abreast of new technologies will almost certainly be too little, too late.

RPS programs are also inadequate because they set ad hoc short-term goals for deployment of renewables, with no plan for the long-term transition of the energy sector. The percentages established by the RPS programs do not provide a long-term path to achieve the goal that science tells us is necessary—achieving GHG emissions neutrality by 2050. The goals were often based on what was believed achievable by a date certain, and often undershot what could be achieved. These ad hoc goals were often quickly met and did not provide meaningful price incentives to drive additional reductions. To meet the larger goal cost effectively requires a firm long-term target based on a technology-neutral standard for reducing emissions of carbon dioxide equivalent ($CO_2e$).

### B. Markets and Technology Have Changed

Changes in market conditions and technology improvements also support a change in focus that more directly targets GHG reduction. Improvements in solar and wind technologies have reduced capital costs and increased the efficiency of production. The levelized costs of wind and solar power have dropped dramatically over the past decade, such that the levelized cost of unsubsidized wind in 2019 was approximately 30% of that in 2009 and the levelized cost of unsubsidized solar dropped even more,

5. *See* Robert B. McKinstry Jr., *Putting the Market to Work for Conservation: The Evolving Use of Market-Based Mechanisms to Achieve Environmental Improvement in and Across Multiple Media*, 14 Pa. St. Envtl. L. Rev. 151 (2006); 42 U.S.C. §§7651-7651o (setting forth acid rain cap-and-trade program established in the 1990 Clean Air Act Amendments).
6. *See*, *e.g.*, Solar Energy Industries Association, *New Jersey Solar*, https://www.seia.org/state-solar-policy/new-jersey-solar (last visited July 7, 2020).
7. UNFCCC, May 9, 1992, art. 2, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107, http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf.
8. The cushion is much smaller than believed at the beginning of the century, such that an increase of even two degrees Celsius from pre-industrial conditions will likely cause "dangerous anthropogenic interference with the climate system" with considerable adverse impacts on ecosystems and human health and welfare alike. Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty (Valérie Masson-Delmotte et al. eds., IPCC 2018) [hereinafter IPCC 2018 Report], https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf; *see also* U.S. Global Change Research Program, Fourth National Climate Assessment, Volume II: Impacts, Risks, and Adaptation in the United States (2018), *available at* https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf (concluding that without "substantial and sustained mitigation," the United States would suffer substantial damage to its natural resources and its economy).
9. IPCC 2018 Report, *supra* note 8.
10. John C. Dernbach, *Introduction*, *in* Legal Pathways to Deep Decarbonization in the United States 1 (Michael B. Gerrard & John C. Dernbach eds., Envtl. L. Inst. 2019).
11. Federico Cheever et al., *Forestry*, *in* Legal Pathways to Deep Decarbonization in the United States, *supra* note 10, at 823, 828.

with the 2019 cost representing only approximately 11% of the 2009 cost.[12] In the month of April 2020, for the first time, the amount of electricity generated by renewable sources exceeded that generated by coal, and the Energy Information Administration predicts that in 2020 solar and wind energy will constitute 76% of new generation capacity, adding 42 gigawatts, while coal and natural gas plants will account for 85% of electricity generation plant closures.[13]

Meanwhile, directional drilling and "fracking" have facilitated the development of shale oil and gas formations that has driven the price of natural gas to unanticipated lows. The spot price of natural gas has fallen from a high of $13.42 per million British thermal units (Btu) in October 2005, to $2.65 in November 2019 before the effect of the COVID-19 pandemic and to $1.74 in April 2020.[14] The resulting reduction in the cost of gas-fired generation threatens the economic viability of nuclear plants, the largest source of non-emitting power, and is restraining investment in advanced nuclear power generation and greater deployment of wind, solar, and storage technologies.

The wholesale electricity price in regional transmission organization (RTO)- and independent system operator (ISO)-run markets is determined in complex auction markets. Participating generators will submit bids in these daily auctions reflecting the marginal operating costs of their generating facilities.[15] Those marginal costs consist, for the most part, of fuel costs and costs of pollution control and waste disposal. Many non-emitting technologies—such as nuclear, wind, and solar—therefore have very low marginal operating costs and will bid at or near zero. The "bid stack" of resources typically creates a supply curve with non-fuel renewables and nuclear at the low end, coal in the middle, and natural gas combined-cycle resources followed by single-cycle gas peaking plants and diesel or oil-fired generation at the high end. All generators get paid the same auction clearing price, so those generators with low bids earn a surplus over their operating costs that allows them to defray fixed costs such as long-term maintenance and debt service, while the generators whose bids are at or near the clearing price do not cover their full fixed costs (at least on that day).

Safe, reliable operation of the power grid requires excess resources as reserves to assure a seamless response to the loss of a generator or transmission line. These resources are not selling power at all. Therefore, separate "capacity markets" have been established to help cover the fixed costs of enough resources to assure an adequate reserve margin.[16]

The dramatic drop in the cost of natural gas and the growing supply of renewables in some markets have put downward pressure on wholesale electricity prices and squeezed margins below fixed cost for some resources. Otherwise viable nuclear plants have prematurely closed to be replaced by fossil plants that emit GHGs.[17] Some states have adopted zero emissions credit (ZEC) programs to save some of those plants, but nuclear plants that are not protected by these programs face a threat of shutdown.[18] Although the low price of natural gas has also accelerated the closure of coal-fired power plants, the "all of the above" approach necessary to achieve deep decarbonization requires retention and expansion of all types of non-emitting plants. Replacing a coal-fired plant with a combined-cycle natural gas-fired plant will reduce GHG emissions by 60%, but replacing a nuclear plant with a natural gas-fired plant will increase emissions and lock in a higher emissions rate for the life of the plant, which now will likely extend beyond 2050.

RPS programs and programs that attempt to extend subsidies to nuclear and other technologies, such as the ZEC programs adopted by Illinois, New Jersey, New York, and other states, are facing increasing regulatory scrutiny from the Federal Energy Regulatory Commission (FERC). FERC has required RTOs and ISOs, such as the PJM Interconnection, Inc. (PJM), to exclude resources that benefit from technology-based state subsidies.[19] Thus far, FERC hostility has not, however, extended to technology-neutral mechanisms that put a price on GHG emissions, such as electric-sector cap-and-trade programs administered by the Regional Greenhouse Gas Initiative (RGGI)[20] and the economywide programs administered by California and Québec.[21] A transition to a technology-neutral program

12. *Levelized Cost of Energy and Levelized Cost of Storage 2019*, Lazard, Nov. 7, 2019, https://www.lazard.com/perspective/lcoe2019.
13. Silvio Marcacci, *Renewable Energy Prices Hit Record Lows: How Can Utilities Benefit From Unstoppable Solar and Wind?*, Forbes, Jan. 21, 2020, https://www.forbes.com/sites/energyinnovation/2020/01/21/renewable-energy-prices-hit-record-lows-how-can-utilities-benefit-from-unstoppable-solar-and-wind/#31f3eed82c84.
14. U.S. Energy Information Administration (EIA), *Henry Hub Natural Gas Spot Price*, https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm (last released July 1, 2020).
15. See *Federal Energy Regulatory Commission v. Electric Power Supply Association*, 136 S. Ct. 760 (2016), for a discussion of energy market dispatch and how electricity markets function; see also *Zero Zone v. U.S. Dep't of Energy*, 832 F.3d 654, 46 ELR 20137 (7th Cir. 2016), *cert. denied*, 587 U.S. ___ (2019); *Coalition for Competitive Elec. v. Zibelman*, 272 F. Supp. 3d 554, 47 ELR 20092 (S.D.N.Y. 2017), *aff'd sub nom. Electric Power Supply Ass'n v. Hughes*, 906 F.3d 41 (2d Cir. 2018), *cert. denied*, 587 U.S. ___ (2019).
16. Kathleen Spees et al., *Capacity Markets—Lessons Learned From the First Decade*, 2 Econ. Energy & Envtl. Pol'y 1 (2013).
17. Jim Efstathiou Jr., *Exelon to Shut Three Mile Island Nuclear Plant*, Bloomberg, May 8, 2019, https://www.bloomberg.com/news/articles/2019-05-08/exelon-to-shut-three-mile-island-as-nuke-bailout-bill-founders.
18. *Zero Zone*, *supra* note 15; *Zibelman*, *supra* note 15.
19. The New York and Illinois programs were upheld by the U.S. Courts of Appeal for the Second and Seventh Circuits and the U.S. Supreme Court denied petitions for certiorari in *Zibelman* and *Zero Zone*, respectively, which found that they did not infringe on FERC's authority to set wholesale rates. Different considerations might apply to a FERC approval of an action by an RTO or ISO to prohibit participation by subsidized sources in the capacity markets. *See*, *e.g.*, Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288, 46 ELR 20078 (2016).
20. RGGI, *Home Page*, https://www.rggi.org/ (last visited July 7, 2020).
21. California Air Resources Board (CARB), *Cap-and-Trade Program*, https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program (last visited July 7, 2020); Government of Québec, *The Carbon Market, a Green Economy Growth Tool!*, http://www.environnement.gouv.qc.ca/changementsclimatiques/marche-carbone_en.asp (last visited July 7, 2020); *see* United States v. California, No. 2:19-cv-02142 (E.D. Cal. Mar. 12, 2020) (granting partial summary judgment to the state of California and dismissing Donald Trump Administration claims that the California and Québec cooperation violates the Treaty and Compacts Clauses of the U.S. Constitution); United States v. California (E.D. Cal. July 17, 2020) (granting summary judgment on remaining preemption claims and entering judgment against the United States).

aligning costs and benefits more closely with environmental protection goals appears warranted.

### C. Cross-Sector Effects

An "all of the above" approach to climate disruption will require states to consider the emissions impact of other sectors. Studies of policies to achieve broader decarbonization goals uniformly suggest that moving away from fossil fuels will require electrification of substantial portions of the transportation, building, and industrial sectors as well as decarbonization of the electric sector.[22] RPS programs currently burden electricity consumption with the cost of RECs by imposing those costs on electricity distributors, who pass the costs through to electricity consumers. The RPS programs' limited focus creates an adverse double whammy. First, by imposing costs on electricity consumption generally while not imposing costs on GHG emissions from other sectors, these programs discourage acquisition of electric vehicles, replacement of fossil fuel-fired heating, cooling, and cooking systems, and electrification of industrial processes.

Second, the imposition of REC costs on electricity customers dampens demand for all types of electricity generation, reducing the wholesale price paid for non-emitting generation as well as fossil generation. This reduces the return on investment to non-emitting generation, creating more pressure on non-emitting generation not favored with a subsidy, such as nuclear, large-scale hydroelectric, and fossil fuel generation with CCS, and discouraging investment in all types of non-emitting generation.

Finally, it will be critical for states to directly address GHG emissions in other sectors. A technology-based standard in the electric generation sector has perverse effects as discussed, but in other sectors of the economy it would be an unworkable constraint on innovation. A CRS program based on $CO_2$e emissions could easily be extended to other sectors, such as commercial building energy use, or could be blended with other emissions-based programs to establish a common carbon price.

## III. Other Lessons Learned From RPS Programs

Beyond the policy issues, defining RECs as a bundle of commodities caused a number of problems for RPS programs. The first wave of RPS programs were intended to serve as economic development tools as well as a carbon reduction mechanism.[23] The hope was that they would spur in-state development of renewable energy generation facilities. However, since RECs as defined were a "product" that could be created anywhere, many states opened their programs to RECs created in other states lest they run afoul of the "dormant" Commerce Clause of the U.S. Constitution by discriminating against out-of-state products. Many states ended up requiring their ratepayers to subsidize out-of-state projects by paying the cost of their RECs.[24]

The economic development strategy was to encourage investment in new renewable energy facilities by subsidizing the value of their power generation with RECs. However, energy customers who installed their own renewable electric generation had to sell the RECs to claim the state subsidy. Because they had sold the renewableness of their electricity production by selling RECs, those customer-generators were not allowed to state the obvious—that they were using renewable energy to power their home or facility.[25] They were denied the public relations and personal satisfaction benefits that were often a major motivating factor.

## IV. The CRS

### A. The Average Emissions Target

We propose legislation that would replace an existing RPS with a CRS that uses a GHG emissions-based standard, not a technology-based standard.[26] The legislation would replace RECs with CRCs measured, not in MWh, but in tons of $CO_2$e emissions[27] per MWh of generation. The standard unit might be, for example, 200 pounds or one-tenth of a ton—not so large that individual small generators have to deal in odd-lot fractions—but we refer hereinafter to "tons" for ease of reference. As with an RPS, low-emissions generators (both utility-owned, where permitted, and non-utility) would be entitled to receive CRCs. However, the requirement to purchase and retire CRCs would not be imposed on retail sellers as with an RPS, but rather on high GHG-emitting generators. The cost of purchase would not be passed through to customers in a distribution charge as with an RPS.

The CRC entitlements of low-emitting generators and the CRC purchase obligations of high-emitting generators would be established with respect to a statewide target for average $CO_2$e emissions per MWh of electricity generated (the "Average Emissions Target"). Zero-GHG emitters, such as the renewable generators that were the original

22. *See*, *e.g.*, James H. Williams et al., Energy and Environmental Economics, Inc. et al., US 2050 Report, Volume 2: Policy Implications of Deep Decarbonization in the United States 49 (2015).
23. E.g., S.B. 1078, 2001-2002 Leg. Sess. (Cal. 2002), includes the following finding at §399.11(b): "Increasing California's reliance on renewable energy resources may promote stable electricity prices, protect public health, improve environmental quality, *stimulate sustainable economic development*, *create new employment opportunities*, and reduce reliance on imported fuels." (emphasis added), *available at* http://www.leginfo.ca.gov/pub/01-02/bill/sen/sb_1051-1100/sb_1078_bill_20020912_chaptered.html.
24. *See*, *e.g.*, Mark Burger, *Pennsylvania Requires Solar SRECs to Come From Within the State*, PV Mag., Nov. 6, 2017, https://pv-magazine-usa.com/2017/11/06/pennsylvania-requires-solar-srecs-to-come-from-within-the-state/.
25. *See* Guides for Use of Environmental Marketing Claims, 16 C.F.R. §260.15(d) (2019).
26. This approach could also be used federally or in states without an RPS.
27. GHGs are defined to include $CO_2$, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, and other fluorinated GHGs. 40 C.F.R. §98.6 (2019) (definition of "greenhouse gas or GHG"). These compounds have differing warming potentials. Emissions of GHGs are measured in $CO_2$e. $CO_2$ is the most common GHG but has the lowest warming effect, so that $CO_2$ is the lowest common denominator. *See* 40 C.F.R. §98.6 (2019) (defining $CO_2$e as measurement of GHGs using Equation A-1).

beneficiaries of an RPS, would get the largest entitlements and the highest GHG emitters, such as coal- and diesel fuel-fired generators, would have the largest per MWh obligations. The initial Average Emissions Target would be set somewhat lower (less $CO_2e$ emissions) than the current statewide average for all generators for all hours of generation. The Average Emissions Target would reduce in annual increments to reach zero by 2050, the date by which world emissions must reach zero in order to avoid the worst ravages of climate change according to the latest IPCC report.[28] The effect over the term of the CRS program would be to slowly reduce the entitlements of low-GHG generators and increase the obligations of high-GHG generators, with the expectation that the statewide average emissions for electric generation would be zero at the end of the program.

Entitlements and obligations for CRCs would be based on the measured average amount by which each generator's $CO_2e$ emissions per MWh are below or exceed the Average Emissions Target. This allocation process permits, for example, a fossil fuel generator with CCS technology that is 90% effective at removing $CO_2e$ from its emissions, to receive CRCs for the amount by which its average emissions are less than the current Average Emissions Target. Although the $CO_2e$ accounting will involve some complexities, as with any emissions-based system, the basic rule is simple: above-average generators get CRC entitlements and below-average generators get CRC obligations, and the entitlements and obligations are proportional to each generator's individual performance.

The following numerical examples, based on hypothetical power plants that perform at the national average emissions levels for fossil fuel generators, illustrate the operation of the standard. If the Average Emissions Target was initially set at .25 tons of emissions per MWh, an average efficiency gas-fired plant would produce emissions of .46 tons per MWh and would have to purchase .21 tons per MWh generated. An average efficiency coal plant would produce emissions of 1.105 tons per MWh generated and would have to purchase .855 tons per MWh.[29] A solar, wind, hydro, or nuclear generator with zero emissions would be entitled to .25 tons per MWh—the amount by which it is below the Average Emissions Target. If an average efficiency gas-fired plant with CCS achieved 90% $CO_2e$ emission reductions, then it would emit approximately .045 tons per MWh and be entitled to CRCs equal to .205 tons per MWh.[30]

CCS applied to biogenic fuels would effectively create negative emissions. The combustion of the biogenic fuel would be treated as zero emissions, and the capture and sequestration of $CO_2e$ would be entitled to additional CRCs. Following the example above, a coal generator with CCS that achieves 90% removal of $CO_2e$ and that also co-fires 20% biomass, would have an entitlement to .205 tons of CRCs per MWh of electricity generated with coal (as in the example) and would have additional entitlements to .25 tons per MWh for zero-carbon biomass generation plus .205 tons (at 90% removal) for CCS applied to biomass. These negative emissions actually reduce atmospheric GHGs rather than avoiding or increasing them.

### B. *The CRC Instrument*

Unlike RECs, CRCs will be a single-purpose policy instrument of the state. They are measured by a specified quantity of $CO_2e$ reductions *from the Average Emissions Target*, but their only expected value comes from sale to high-GHG generators. They do not represent any other environmental commodity and cannot be used for any other purpose in any other jurisdiction. Private individuals and institutions who self-generate with renewable energy could simply retire them and third parties could purchase them and do the same.

The effect of such voluntary retirements would essentially be to buy an acceleration of state goals. However, CRCs carry no advertising claims about use of low-carbon power, and a renewable energy generation owner or a renewable energy host with a power purchase agreement (PPA) can both claim to be using renewable power even if they or their PPA seller sell the CRCs. In this respect, they operate like federal tax credits, which provide an incentive to build and operate renewable energy facilities without affecting title to any commodity.

CRCs would be tradable and could be the subject of a long-term CRC sales contract. As between private parties, the CRS legislation would provide that CRCs are intangible personal property for purposes of creating a security interest under the state's Uniform Commercial Code, and that the state will enforce contracts for their sale or exchange; but the legislation would also specifically disavow any state obligation to continue the program in the

28. IPCC 2018 Report, *supra* note 8. Some states have already chosen a more aggressive target for the electricity sector. A more aggressive date would be appropriate where state policymakers decide to delay actions on other sectors or in the event science suggests that is necessary. We suggest starting with 2050 based on current knowledge and with the expectation that a suite of policies will be selected so that all sectors reach net zero by 2050. The requirements of the UNFCCC that the Parties employ measures governed by the precautionary principle, with developed nations taking the lead, suggest that states in the United States employ more aggressive targets. UNFCCC art. 3, §3 (precautionary principle), art. 4, §2(a) (developed nations should take the lead).

29. *See* EIA, *Frequently Asked Questions (FAQS): How Much Carbon Dioxide Is Produced Per KilowattHour of U.S. Electricity Generation?*, https://www.eia.gov/tools/faqs/faq.php?id=74&t=11 (last updated Feb. 20, 2020).

30. Many combustion generators use more than one type of fuel, either sequentially or by co-firing. These include biomass generators that may use some natural gas for startup firing, coal generators that also burn a percentage of biomass fuel on a regular basis, and dual-fuel turbines that typically burn natural gas but can burn diesel as a backup. Similarly, cogeneration facilities provide two different outputs—electricity and thermal energy—and fuel use and resulting emissions would need to be allocated between the outputs to prevent distortion of program incentives. For these plants, careful accounting of fuel use on a Btu basis is necessary to allocate emissions to each fuel or each output so that they can be separately treated for CRS purposes. Current GHG reporting protocols account for both differences in fuels, allowing elimination of biogenic $CO_2$, which does not contribute to climate change, and cogeneration. 40 C.F.R. §98.3 (2019).

same form or to assure the value of CRCs.[31] State legislation cannot determine the status of an instrument for commodity regulatory purposes under federal statutes. It can, however, affirm the status of CRCs as a compliance product with no value outside the state-run compliance system, and express the intention that a contract to sell CRCs generated at a later date is a forward sale for physical delivery of an intangible commodity, not a futures contract. Unlike a futures contract, retirement of a CRC requires delivery of the instrument (physically or electronically) to the state.

CRCs would be bankable (in other words could be held and retired in subsequent years) by any person or entity.[32] As discussed below, we suggest that the Average Emissions Target and other program parameters be set based on modeling estimates that set the price of CRCs at a level that would allow existing RECs to be traded in at prices equal to or better than the current market prices for RECs. However, the declining Average Emissions Target would result in the trade-in value of RECs measured in tons of $CO_2e$ to decline over time. The effect on the value in dollars is uncertain, as discussed further below.

### C. Operation of the Program

We suggest that the legislation establish a public auction process for CRCs. We expect there to be a private trading market for CRCs as there currently is for RECs, but those markets can provide limited transparency. A public auction not only would permit CRC generators to participate, but also would allow the state to be the seller of last resort, to assure that adequate generation supplies are not curtailed for lack of offers of CRCs. We suggest an annual auction with potential state participation as a seller, and one or more follow-on auctions annually for private sellers only.

The auctions will set a price on $CO_2e$ emissions—what is typically referred to as a "carbon price." The carbon price, in turn, would establish the value of CRCs to the low-emissions generators and the cost of compliance to the high-emissions generators. In addition to determining the revenues that low-emissions project developers can count on in financing their generation projects, and the loss of revenues to high-emissions generators, the carbon price level determines the relative competitive position of the different generators in the market.

In this respect, the CRS is mathematically equivalent to a cap-and-trade program with the same carbon price. In the cap-and-trade program, the range of incentives is from no incentive for zero-emissions generators to a strong disincentive for high-emissions generators. By comparison, in our proposed CRS program, while each generator faces the same carbon price as in the cap-and-trade program, it gets a credit for each MWh it generates equal to the Average Emissions Target multiplied by the carbon price. The zero emitters get the full credit, and the high-emissions generators' obligation is partially offset. The range of incentives, from zero emissions to high emissions, is identical in absolute terms to the cap-and-trade program and, accordingly, although the incentive effect is different, the competitive effect in the market is the same.

Of course, the carbon price will depend on market conditions that cannot be accurately predicted more than a short distance in the future. We suggest, for the same reasons that they are often suggested in cap-and-trade programs, that there be a floor and a ceiling price for CRCs. The floor allows low-emissions generators to rely on a minimum level of revenues from the CRC program, and the cap provides a limit on the high emitter's obligation. These limits serve as "training wheels" for the market. We discuss the dynamics of these measures below. We do not propose a "cap" on overall emissions that would be a critical element of a cap-and-trade program.[33] We believe that the Average Emissions Target will serve the same purpose. In the event that all GHG emissions are not eliminated or offset at the point when the Average Emissions Target reached zero, the CRS program would simply act as a fee imposed on emissions at the state's auction reservation price.

Finally, the CRS legislation should designate a state agency or instrumentality (such as the public utility commission or the agency responsible for environmental regulation) to administer the program (the "Administrator"). The Administrator or a designated third party would run the auctions, and the Administrator would be in charge of assuring accurate CRC accounting and could be given discretion to set and revise certain policy parameters in response to program experience. These additional parameters could include the floor and ceiling prices on CRCs. As with current RPS programs, actual registry and accounting functions could be delegated to private institutions (such as the PJM Generation Attribute Tracking System (GATS)[34]) under the supervision of the Administrator.

## V. Transition From RPS

### A. Existing RECs and Contracts

One of the goals of the CRS is to create a smooth transition between the technology-based RPS and the GHG-based CRS. The CRS would permit and encourage exchange of existing RECs issued for carbon-free generation[35] for CRCs at the then-entitlement value (as determined under the CRS program) of carbon-free generation. In the example above, each renewable energy REC would be worth 0.25 tons of CRCs. That value would decrease as the Average Emissions Target decreases over time, which

31. States may also wish to consider whether registries for commodities such as CRCs should be given the same treatment as depositary institutions and permit security interests in registry accounts to be perfected by account control agreements rather than Uniform Commercial Code filings.
32. Some RPS programs provide limits on banking duration. We have not suggested a specific limit here.
33. As discussed below, the CRS program could operate with a cap-and-trade program, just as RPS programs currently operate with both the RGGI and California/Québec programs.
34. *See* PJM Environmental Information Services, *About GATS*, https://www.pjm-eis.com/getting-started/about-GATS.aspx (last visited July 7, 2020).
35. This would include solar, wind, biomass or biofuel, or typically any other GHG-free generation contemplated by the RPS such as small hydropower in some states.

gives an incentive to exchange sooner rather than later. In practice, RPS programs did not generally provide for granting RECs for low but more than zero GHG-emitting generators, but if they did, the translation mechanism would work the same in principle. In the handful of states that have issued ZECs for nuclear power generation, ZECs could also be exchanged for CRCs on the same basis as zero-emissions RECs.

We suggest that CRS legislation permit zero-emissions generators that had presold RECs under the RPS be allowed to choose between continuing to receive RECs or receiving CRCs going forward for a period of time, say 10 years. This would permit those generators to honor existing long-term contracts for the sale of RECs.[36] The purchaser of these "grandfathered" RECs would have the option to trade them for CRCs, to make use of them in other states that accept them, or to sell them in the voluntary market. To the extent that existing or grandfathered RECs bundle in other rights, those rights would survive, but would disappear in time as RECs are exchanged for CRCs or retired in programs where they are eligible. The legislation could encourage long-term REC purchasers to convert their contracts to CRCs by offering a small premium in CRCs if they do.

In short, the state adopting CRS legislation would cease to accept RECs for compliance purposes. Instead, it would give owners of existing RECs and existing forward sellers of RECs the opportunity to use RECs for other purposes but would encourage them to exchange them for compliance instruments (CRCs) in the new program.

### B. Other Legacy Issues

We have stressed that a CRS is intended to be a technology-neutral program. There are circumstances, however, that may argue for an initial period of price support for particular technologies. Many RPS programs already provide for special tiers and set separate targets for solar RECs (SRECs) that result in higher prices for those RECs. To avoid transition shock, CRS program legislation could provide that RECs now included in a special tier of an RPS would continue in a separate tier with a higher floor price that dropped away over time, perhaps five years.

A similar problem arises for existing low-emitting generators at risk for closing in wholesale markets as currently designed. By far, the largest sources on non-emitting generation in the current fleet nationally are nuclear—around 8.5% of all generation—and hydroelectric—about 2.7%.[37] When the Three Mile Island nuclear plant closed in Pennsylvania in 2019, it represented a loss of more low-emitting generation than the entire increase in renewable resources in Pennsylvania since it adopted its RPS.[38] As described above, the economic crisis facing some nuclear plants grew sufficiently grave that some states adopted ZEC programs. Because the CRS programs would benefit all non-emitting sources, including nuclear and large-scale hydroelectric, they should replace existing ZEC programs. However, because the ZEC programs generally provide subsidies that are intended to replace or supplement capacity payments, the CRS payments may or may not be sufficient to prevent their closure. Rather than lose the existing capital investment in legacy low-emissions generators, it may also make sense to provide a separate tier and temporary higher floor price for these assets.

### C. Leakage

Generators from outside the CRS state may not face requirements to purchase CRCs in their home state, and transition to a CRS may cause "leakage" in the state's power generation sector. Leakage occurs where a higher-emitting facility in a neighboring state can displace a lower-emitting facility in the state with an emissions pricing program because the higher-emitting facility can submit a lower bid and move ahead in the dispatch order. We propose to eliminate leakage in the CRS program by imposing the obligation to purchase CRCs on importers of power to the state as well as in-state generators.[39] However, importers of low-carbon electricity would not be entitled to CRCs. Most RTOs and ISOs have existing programs to track emissions attributes that could be employed to apply these obligations, including the PJM GATS, New England Power Pool Generation Information System, New York Generation Attribute Tracking System, and California's emissions reporting requirements.[40]

Because the Federal Power Act gives states authority over electric generation facilities to the exclusion of the federal government, and also because the CRC program would impose requirements on out-of-state sources similar to those imposed on interstate sources, this program should not run afoul of the dormant Commerce Clause restrictions on state programs. The U.S. Courts of Appeal for the Second and Seventh Circuits rejected dormant Commerce Clause challenges to the New York and Illinois ZEC programs.[41] Likewise, California's imposition of its low-carbon fuel standard on importers' purchase allowances in order to level the playing field between in- and out-of-state

36. Of course, parties to such contracts could simply agree to modify them, and that would be the preferred outcome, but the intent of grandfathering RECs is to avoid a potential excuse for the purchaser to cancel such a contract.
37. Wind is rapidly catching up to hydroelectric at 2.5%, and solar, despite exponential growth, is a little below 1%. Lawrence Livermore National Laboratory, *Energy Flow Charts*, https://www-gs.llnl.gov/energy-homeland-security/energy-security/energy-flow-charts (last visited July 7, 2020).
38. *See* Spees et al., *supra* note 16.
39. No charges would be imposed on power transmitted through the state to a third-state purchaser.
40. PJM Environmental Information Services, *supra* note 34; New England Power Pool Generation Information System, *Home Page*, https://www.nepoolgis.com/ (last visited July 7, 2020); New York State Energy Research and Development Authority, *New York Generation Attribute Tracking System (NYGATS)*, https://www.nyserda.ny.gov/All-Programs/Programs/NYGATS (last visited July 7, 2020); California Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, Cal. Code Regs. tit. 17, div. 3, ch. 1, subch. 10 (2020).
41. Coalition for Competitive Elec. v. Zibelman, 272 F. Supp. 3d 554, 561, 47 ELR 20092 (S.D.N.Y. 2017), *aff'd sub nom*. Electric Power Supply Ass'n v. Hughes, 906 F.3d 41 (2d Cir. 2018), *cert. denied*, 587 U.S. ___ (2019); Village of Old Mill Creek v. Star, Nos. 17 CV 1163 and 1164, 2017 WL 3008289 (N.D. Ill. July 14, 2017), *aff'd sub nom*. Electric Power Supply Ass'n v. Star, 904 F.3d 518 (7th Cir. 2018), *reh'g denied* (Oct. 9, 2018), *cert. denied*, 587 U.S. ___ (2019).

sources withstood a Commerce Clause challenge.[42] Similar challenges to CRC leakage control measures are likely to have the same result.

## VI. Policy Variables and Prices

### A. Policy Variables

The operation of a CRS program will depend critically on the policy parameters set forth in the legislation or selected by the Administrator to the extent empowered under the legislation. The level of the Average Emissions Target as compared with a state's existing average emissions will determine the relative scarcity of CRCs and will affect both price and the resulting incentive to build new low-emissions generation and to retire or throttle back high-emissions generation. Because the Average Emissions Target will decrease with time, fewer CRCs will be created for each MWh of low-emissions generation, and each MWh of high-emissions generation will require the purchase of more CRCs. Other things being equal, this will reduce the supply of CRCs while increasing demand, thus driving up the price.

However, if the program works as intended, the price incentives will induce new low-emissions entrants in the market (increasing supply) and retirements or curtailments of high-emissions generators (decreasing demand). Other things being equal, these forces will reduce price. In addition, we anticipate rapid evolution and cost reductions in low-emissions generation technology, much as we have experienced with solar generation.[43]

A price cap and floor seem necessary for several reasons. The net effect of the forces described in the prior paragraph will be difficult to predict with certainty, and all generators will value predictability. In particular, decisions to commit to construction of new generators will require a dependable revenue stream, and developers may look for long-term CRC sale contracts to provide certainty. While the cost of new low-emissions generation will provide a natural cap on the CRC value, development timetables will not be fast enough to prevent price swings. To provide an effective cap, the Administrator must be the seller of CRCs of last resort, and the Administrator's reserve price will be an effective cap on the CRC price.

We suggested above that the initial Average Emissions Target should be selected to assure that CRCs are at least as valuable as RECs (or more) at the outset. While this would primarily be accomplished through the initial Average Emissions Target, setting a floor equal to 80% of the three-year average of REC prices (or perhaps 80% of last year's price if prices have been steadily rising) would also serve to cushion the transition. Setting a floor price also ensures that CRCs provide a meaningful incentive to move to lower emissions generation and can assure support for nuclear and CCS. Where an existing RPS has a high separate target for SRECs, with a resulting high SREC price, legislators may wish to continue a form of solar set-aside that tapers off in five or 10 years. As noted above, the legislature may also wish to maintain ZEC floors. If the carbon price in the CRS is high enough, however, separate treatment may be unnecessary, and the hope is to move to a fully technology-neutral program.

### B. Wholesale Electricity Prices

In an open wholesale market, such as exists in most RTOs and ISOs, the cost of the program would directly affect the energy market bids of generators but only indirectly affect the wholesale price. Low-emissions generators, as discussed above, are generally bidding at or near zero.[44] Their bids will largely be unaffected by CRC revenues. On the other hand, fossil fuel generators would have a direct increase in per MWh costs and can be expected to raise their bids. Natural gas generators (at least older ones) are typically at the margin and set the market clearing price in most hours. As a first approximation, the rise in the wholesale price would be the rise in cost to gas-fired generators. The bids of coal-fired generators would be raised substantially more than those of gas-fired generators.[45] This could simply result in coal plant margins being squeezed, or could result in an inversion of the typical past supply curve.

For example, as discussed above, in the PJM market, coal-fired generators currently occupy a lower bid tier than most gas-fired generation, although that has been changing at the margin because of low natural gas prices and increased efficiency of newer combined-cycle gas plants. A CRS program could accelerate that change and leave coal generation more frequently at the margin that sets the price. The actual increase in the wholesale clearing price then could be far lower than the increase in coal generation prices, though potentially somewhat higher than the increase in gas generation prices.

The situation in PJM, to continue the example, is somewhat more complex. The increase in bids in the state with a CRS program would not be matched in states that do not adopt a similar program. Policy measures discussed below will prevent out-of-state resources from competing unfairly with in-state resources but, other things being equal, in-state fossil fuel generators would become somewhat less competitive for exporting power and less likely to set (and raise) the price. Further, if all the segments of PJM's multistate grid had unlimited transmission to and

42. Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070, 43 ELR 20216 (9th Cir. 2013); Rocky Mountain Farmers Union v. Corey, No. 17-16881, 49 ELR 20010 (9th Cir. Jan. 18, 2019).

43. *See, e.g.*, *Levelized Cost of Energy and Levelized Cost of Storage 2018*, Lazard, Nov. 8, 2018, https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2018/.

44. Or below zero when the value of RECs and production tax credits make it worth it to run at a nominal loss.

45. It is worth noting that the proportionate increase for coal compared to natural gas would be greater in the CRS program than in a cap-and-trade program. Using the values in the example above, coal-fired generators without CCS would pay roughly four times more per MWh than natural gas generators in the CRS program, whereas in a cap-and-trade program, in which offset obligations are based on the full amount of emissions, the comparative burden on coal plants would be around 2.4 times the burden on natural gas plants.

from other segments, a wholesale price increase would be spread equally over all the states in the PJM grid.

However, PJM's grid has transmission constraints, which means that the locational price in a constrained zone may be higher than surrounding zones. Thus, the wholesale price rise occasioned by a CRS program may to some extent be borne in a local region of the state. Other RTOs' and ISOs' energy markets have variations in detail and "individual results may vary," but there will be an overall tendency for some wholesale price rise that may be more concentrated within transmission-constrained areas.

Dispatch rules in non-RTO and ISO states generally follow a similar pattern but are based on actual variable costs, not bid costs. This "least cost dispatch" could be expected to have similar effects on generation costs to those described above. The incentives to build generation for vertically integrated utilities, however, are far more complex than for independent power producers in transparent markets.

### C. Retail Electricity Prices

It is difficult to predict the all-in effect of the CRS program on retail electric prices in any one state. In most states, the cost of the RPS is passed through to retail purchasers in the form of a "public benefit charge" paid by all distribution customers. Where this is true, retail prices would be reduced by the aggregate amount of the current costs for REC purchases by retail sellers. As other low-emissions technologies become eligible for CRCs, the aggregate purchase payments for CRCs would be expected to increase (assuming the prices paid to sellers of CRCs are equivalent in carbon value to REC prices). However, these costs will be borne by high-emissions generators, and filtered through the wholesale price as described above.

The discussion above is obviously not a substitute for detailed modeling of specific markets. It suggests to us, however, that the assured reduction in retail prices from the elimination of public benefit charges to pay for RECs is reasonably likely to outweigh any increase in retail prices that follows from increased wholesale prices being passed through in retail prices. Further, this "comparative statics" result is likely to be overwhelmed over time by the transition to a cleaner generation fleet. Wind and solar generation have experienced dramatic price declines as technology has improved, and battery storage is currently experiencing similar declines, which will further enhance the effectiveness of solar generation.[46]

We anticipate that CCS and other emerging zero-carbon generation and carbon reduction technologies will also emerge. To the extent that these technologies are able, with CRC support, to populate the low-priced end of the supply curve, they will tend to reduce wholesale prices, which will pass through to retail prices. Either more and more high-priced fossil fuel generators will drop out, reducing prices, or they will balance increased electricity use in other sectors without further price increases.

46. *Supra* note 40.

### D. Comparisons to Other Programs

We believe that a CRS program can effectively support the transition to a carbon-neutral electricity generation sector. To make the transition, the program must provide a sufficient return both to support continued operation of legacy low-emissions generators such as nuclear and hydroelectric generators, at least until they can be economically replaced, and to support investment in new low-emissions generating facilities, including expansions of existing generators, such as occurs in the case of nuclear uprates. That return can come from a combination of sufficiently high wholesale electricity prices, capacity payments in markets that offer them, and subsidy payments for low- and non-emitting sources.

As discussed above, the CRS program will raise wholesale prices. The program will also provide a direct subsidy to all low-emissions generators. That subsidy is technology-neutral, and all that matters is fossil-based $CO_2e$ emissions. Biofuel generators would generally receive the same treatment as they receive under most RPS programs, and fossil plants with CCS, nuclear, and large-scale hydro would play on an equal footing with renewables.

We suggest that the combination of a subsidy to low $CO_2e$ emitters with an increase in wholesale prices will provide greater incentives to investment in non-emitting generation than other policy options. Traditional RPS programs increase retail price and thus create barriers to electrification of other sectors without providing any increase in the wholesale price. They also provide no subsidy to most of the largest existing sources of $CO_2e$-free generation (nuclear and large-scale hydro)[47] or to emerging alternative technologies. A cap-and-trade or tax program would impose additional costs on $CO_2e$ emitters, but the benefit to non-emitting generation would largely be limited to the increase in wholesale electricity prices.[48] While that price increase could be expected to be somewhat larger than in a CRS, we do not believe that it would offset the benefit of the subsidy.[49] The larger wholesale price increase would also further suppress demand for electrification. A CRS delivers on a balance of state goals.

## VII. Relationship to Other Goals

### A. Expansion to Other Economic Sectors

The CRS program we propose is in many respects an incremental step forward from existing RPS programs. The most economically efficient solution to reduce the risks of climate change would be to impose a single carbon price on all sectors of the economy combined with other pro-

47. We say most, because states with ZEC programs provide subsidies to some, but far from all, nuclear generators.
48. This discussion omits the impacts on capacity markets.
49. As discussed above, the effect on gas generators would be proportionately larger in cap and trade, and there would be less tendency for the position of gas and coal in the supply stack to be inverted. The wholesale price effect would probably be based more directly on the increase in gas-fired generation pricing.

grams to address market imperfections. Since the CRS program would be measured in $CO_2e$, it could eventually be extended to other sectors of the economy.

The building and transportation sectors would be natural fits (measured in average $CO_2e$ per square foot, average $CO_2e$ per mile for passenger vehicles, average $CO_2e$ per freight ton-mile, etc.). Because most industrial sectors report GHG emissions in $CO_2e$, these companies could also readily be added to the program, basing CRCs on the average $CO_2e$ emissions per unit of production. Adding industrial sectors would create additional encouragement for cogeneration and transition to biofuels, as well as product substitution and production efficiency. Extending the program to other sectors will also further encourage electrification of those sectors. It would reward companies that have already acted to reduce emissions and encourage investment in more efficient production that would further stimulate the economy.

A second way to expand the CRS program to other sectors is to make industries and activities that reduce carbon emissions eligible to receive CRCs. These additional CRCs would tend to reduce the value of CRCs and undermine other goals of the program within the electricity sector, and states considering their inclusion would need to weigh these alternative benefits. This can be accommodated by permitting creation of CRCs based on the negative emissions, just as with the CCS example described above. It could also include measures such as afforestation, soil sequestration of carbon, and reductions in otherwise unregulated emissions from agriculture. Both RGGI and California GHG auction-cap-and-trade programs permit limited creation of similar allowances.[50]

### B. Integration With Other Programs

No program for reducing GHG emissions is a silver bullet. There are more than 1,000 different policy instruments that have been identified to address climate disruption.[51] The most effective approaches to achieving deep decarbonization combine various policy instruments to reflect differences in market responses and policy objectives.

For example, although California employs an economywide auction-cap-and-trade program, it employs a host of additional policy mechanisms to support that program, including, inter alia, an RPS, a low-carbon fuel program, mandatory transportation fuel efficiency standards, investments in clean energy and energy-efficient buildings, and a host of other supporting measures.[52] In the RGGI memorandum of understanding (RGGI MOU), the participating states also commit to implementing a range of complementary energy policies.[53] All RGGI states include an RPS in their inventories of complementary energy policies, and New Jersey and New York have also adopted ZEC programs.[54] The CRC program could thus readily be combined with the existing programs that auction emission allowances with a descending cap and a reserve price, just as those programs are now combined with RPS programs.

### C. State Revenues

RPS programs do not produce revenues for the state. The CRS program does not inherently generate revenues but could be designed to produce a desired revenue level. If at least as many CRCs are generated as are required to be procured, the state would probably not sell any CRCs (absent banking of CRCs, which would increase demand in the current year). However, the level of the Average Emissions Target will determine relative scarcity (again excluding banking activity, either savings or withdrawals), and the state can elect to always sell a fixed level of CRCs each year. This latter policy would not necessarily drive the price to the ceiling. The Administrator could be a price taker for this block and simply let the market determine the clearing price.

The goal of producing revenues, however, is in tension with other goals. Concerns about electricity price increases have led to proposals such as cap and dividend[55] or fee and dividend[56] that would give back to taxpayers the revenues generated by a cap-and-trade or carbon tax program, respectively. Higher retail prices also compete with further electrification of other sectors.

## VIII. Conclusion

A CRS program can be expected to be an effective middle ground between the limited objectives of existing RPS programs and a more comprehensive cap-and-trade program or carbon tax. It will encourage rather than discourage the movement to electrify other sectors of the economy. Our proposed design permits a seamless transition from existing RPS programs and permits integration with other carbon-based programs, including cap-and-trade or carbon tax programs. It is open to new technology. The investment

50. *See* RGGI Model Rule, subpt. XX-10 (2017 revision), https://www.rggi.org/sites/default/files/Uploads/Design-Archive/Model-Rule/2017-Program-Review-Update/2017_Model_Rule_revised.pdf; Cal. Code Regs. tit. 17, div. 3, ch. 1, subch. 10, art. 5, subart. 13 (2020), *available at* https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I81C4C3F07FC011E19772DE7EC34FB4E8&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default).

51. Dernbach, *supra* note 10. Many of these measures involve reducing legal barriers to private climate action rather than additional governmental programs.

52. CARB, California's 2017 Climate Change Scoping Plan (2017), https://ww3.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

53. The RGGI MOU provides:

> Each state will maintain and, where feasible, expand energy policies to decrease the use of less efficient or relatively higher polluting generation while maintaining economic growth. These may include such measures as: end-use efficiency programs, demand response programs, distributed generation policies, electricity rate designs, appliance efficiency standards and building codes. Also, each state will maintain and, where feasible, expand programs that encourage development of non-carbon emitting electric generation and related technologies.

RGGI MOU §7 (Aug. 15, 2006).

54. *See* discussion *supra* notes 18 and 19.

55. *See* Chesapeake Climate Action Network, *Cap & Dividend: The Simple & Fair Path to a Healthy Climate and Prosperous Families*, http://climateandprosperity.org/ (last visited July 7, 2020).

56. *See* Citizen's Climate Lobby, *Carbon Fee and Dividend Policy and FAQs*, https://citizensclimatelobby.org/carbon-fee-and-dividend/ (last visited July 7, 2020).

over the course of the CRS program in the development of a new generation fleet can be expected to drive other improvements in the economy as a whole. There will be job creation,[57] health benefits from lower emissions, and the empowerment of energy customers and communities to take charge of their own energy destiny.[58]

57. *See* Energy Futures Initiative and National Association of State Energy Officials, 2020 U.S. Energy and Employment Report (2020), https://www.usenergyjobs.org/.
58. *See* C. Baird Brown, *Financing at the Grid Edge*, 48 ELR 10785, 10816 (Sept. 2018).