NRDC Comments on VA DEQ's Proposed Carbon Regulation
7/26/2017

On behalf of our over 12,000 members across the Commonwealth, the Natural Resources Defense Council supports the Virginia Department of Environmental Quality's (DEQ) intended regulatory action, "Regulation for Emissions Trading," in accordance with Executive Directive 11 (2017), "Reducing Carbon Dioxide Emissions from Electric Power Facilities and Growing Virginia's Clean Energy Economy."

Just as important, NRDC also thanks the DEQ for its hard and ongoing work on this important issue on behalf of Commonwealth citizens.

The dangers of dumping into our atmosphere unlimited amounts of carbon dioxide pollution, the main driver of already-costly climate change, is well-documented, in both the DEQ's "Regulation for Emissions Trading" NOIRA and Executive Directive 11.

Because of those immediate and growing dangers, Virginia law unsurprisingly clearly encompasses carbon dioxide in its definition of air pollution: "Air pollution means the presence in the outdoor atmosphere of one or more substances which are or may be harmful or injurious to human health, welfare or safety, to animal or plant life, or to property, or which unreasonably interfere with the enjoyment by the people of life or property."[1]

Furthermore, limiting and reducing carbon pollution would also achieve the Air Pollution Control Board's charge to prevent harm to "public health, safety or welfare; the health of animal or plant life; [and] property, whether . . . recreational, commercial, industrial, [or] agricultural."[2]

Limiting and reducing carbon pollution to protect human health and safety, property, and the economy through this proposed regulation is a sensible and necessary approach, because:

- Carbon pollution is indeed an immediate threat to human health and the economy: sea level rise makes Virginia's southern coast one of the most imperiled places in the nation. As sea levels continue to rise, storm surges become higher as well, making most of the Hampton Roads region vulnerable to hurricane flooding. Without significant infrastructure investment, Tangier Island may be uninhabitable by the end of the

[1] Va. Code § 10.1-1300.
[2] 9 VAC 10.

century. Inland areas will see worsened flooding as well, due to heavy storm precipitation, which has already increased 27% between 1958 and 2012 across the Southeast. Henry Paulson's Risky Business Institute estimates there will be $17.5 billion in additional sea-level rise damage and storm damage in Virginia by 2030.

- The warmer temperatures driven by climate change also already increase ozone levels, aggravating lung diseases such as asthma, including in Richmond, which already suffers some of the worst asthma rates in America.

- Carbon pollution threatens plant and animal life: climate change will likely reduce the productivity of livestock, which comprise the bulk of Virginia's farm commodities, and hotter summers will likely reduce corn yields, one of Virginia's largest crop commodities.

- Injury to property, both public and private, is already occurring today. For example, climate change impacts the Norfolk Naval Base and its ability to maintain state and national security in a variety of ways, including impaired electricity availability, transportation inaccessibility, and piers that must be raised at significant cost.

Because of these dangers and others that unmitigated carbon pollution poses to Virginia's human health, its economy, and property, we support the DEQ's proposal to limit carbon dioxide in the Commonwealth, using the same means already proven effective in 1 in 5 states in the country: a sensible, achievable limit on electric sector carbon pollution, with subsequent annual reductions.

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Section 1: Recommendations

This section outlines NRDC's 7 recommendations to the DEQ as it drafts its proposed regulation. Each of these recommendations is focused on ensuring a regulation that: ensures and maximizes Virginia's mitigation of climate change through meaningful but achievable carbon pollution reductions; maximizes energy sector resiliency and economic benefits; and does so in a way that treats all electric sector participants equally to eliminate market distortions, while also protecting any ratepayer and Virginia family that pays an electricity bill from cost increases.

Sections 2 through 4 address specific issues more fully, specifically:

- modeling results that show the environmental, economic, and human health benefits of capping and reducing carbon pollution in the Commonwealth (Section 2);
- allowance allocation options (Section 3); and
- the need to include forest-derived biomass generation-related carbon pollution within the proposed program and its related carbon budgets (Section 4).

Each of the seven recommendations below will help drive economic benefits and mitigate climate change in the most efficient and equitable means currently available to the DEQ. Because clearly, the alternative of no action would instead lead to significant loss of life, catastrophic property damage, and profound economic damage and dislocation across the Commonwealth.

By contrast, mitigating climate change in the manner proposed in the NOIRA, by capping and annually reducing carbon pollution and linking to an already-successful carbon program like the Regional Greenhouse Gas Initiative (RGGI), will drive significant additional economic and health benefits in the Commonwealth (as shown in Section 2).

Those benefits are not limited to direct economic benefits in the form of lower electricity bills and indirect economic benefits in the form of increased public health. The state will also benefit from increased energy sector diversity, and from the job growth associated with finally tapping Virginia's considerable renewable energy and energy efficiency reserves in a meaningful way.

The state's policy of achieving energy independence can also be achieved through this regulation, by resulting in greater reliance on native Virginia resources of energy efficiency, solar, and wind energy, and sending fewer dollars out-of-state to import carbon-based natural gas.

To fully realize environmental, economic, and energy benefits inside the Commonwealth, important choices must be made in how the DEQ both sets a meaningful and sufficiently stringent carbon limit and reductions, and in how it allocates valuable carbon allowances.

Recommendation #1: The Carbon Program Must Limit Emissions Well Beyond a Reputable Business-As-Usual (BAU) Baseline, with Annual Reductions of at Least 4-5%

The emissions limit must reduce emissions significantly below BAU over the course of the program. To determine BAU emissions and annual reduction levels, reliable, non-biased, and reputable data and projections must be used to establish a baseline that is not artificially high, and to set a cap and meaningful annual reductions that protect human health.

The DEQ should rely on transparent estimations of least-cost estimates of what Virginia's business-as-usual emissions will likely be in year 1 of the program. Similarly, the DEQ should avoid biased emissions projections that appear to be set unrealistically high and may include "hot air," such as in Dominion Energy's Plan A in the 2017 Virginia IRP.

As discussed in Section 2, robust modeling indicates a 3% annual reduction is insufficiently stringent to comport with Executive Directive 11 and to achieve technologically feasible clean energy advances and associated job growth. A minimum 4-5% annual reduction should be proposed in the regulation.

Recommendation #2: Allowance Allocations Must Deliver Consumer Benefit and Should be Overseen by a Clean Energy Virginia Initiative Stakeholder Advisory Group

As discussed further in Section 3, the DEQ must ensure the economic efficiency of the program by directing allowance value to consumer benefit, rather than toward utility or generator profit. Just as important, the DEQ must avoid imposing costs on ratepayers and Virginia families by awarding allowances directly to emitting generators for free. Doing so would allow the ultimate price of those allowances to flow to ratepayers and families in the form of higher wholesale electricity costs, while providing an unreasonable windfall profit to generators. As explained below in Section 3, allocating allowances to emitting generators for free would simply result in higher costs for ratepayers.

To ensure economic efficiency and a transparent, undistorted allowance price that levels the playing field for all generators, and to achieve maximum economic efficiency for Virginia citizens through allowance allocation, a standing Clean Energy Virginia Stakeholder Advisory Group (SAG) should be established. The SAG's purpose would be to ensure the overall program and use of revenue is functioning transparently, efficiently, and effectively. The SAG should be comprised of representatives of the Attorney General's Rate Counsel, low-income consumer advocates, NGOs, SCC Staff, the Department of Mines, Minerals, and Energy, the Environmental Justice community, and generators.

Recommendation #3: Forest-derived Biomass Carbon Emissions Should be Covered

As discussed further in Section 4, the DEQ should maximize the environmental and climate change benefits of the program while also avoiding market distortions and program inefficiency by including the carbon emissions from forest-derived biomass generation within the carbon program and related emissions budgets.

Recommendation #4: The DEQ Should Monitor and Avoid Shifting of Emissions Out-of-State

The DEQ should ensure the integrity of the program is not eroded by emissions leakage (the shifting of emissions outside Virginia due to a carbon price on in-state generation) by designing an economically efficient program with minimal market distortions; that maximizes consumer benefits through efficiency investments; and drives significant levels of in-state renewable energy development. These will all deliver least-cost carbon reductions and lessen the impact of carbon prices on carbon-based power flows across state lines.

Because emissions leakage can be minimized through cost-effective development of Virginia's untapped, clean resources like solar and energy efficiency. As indicated in NRDC's modeling discussed below in Section 2, imports of electricity decrease under a carbon limit, rather than increase, largely due to a buildout of native energy resources, rather than more costly electricity imports. Achieving this energy independence helps prevent leakage, by obviating the need for electricity from outside the state.

To ensure the program does not inadvertently lead to increased fossil-based electricity imports from out-of-state, the DEQ should establish an annual program review process for the duration of the program, to assess whether interstate power flows are shifting as a result of the carbon price. This work could be incorporated into the Clean Energy Virginia SAG.

Recommendation #5: The DEQ Should Minimize Administrative Cost by Relying on Proven and Pre-existing Allowance Tracking and Trading Infrastructure

Allowances should comport with and be fully tradable on RGGI's pre-existing platform, which has low administrative costs and robust cybersecurity.

Recommendation #6: Ongoing Review of the Program Must Confirm the Program Has a Positive Impact on Environmental Justice

Climate change is at root a fundamental environmental justice issue, as coastal communities and low-income communities ultimately bear the worst brunt of its impact. Therefore, the program should make significant cuts to carbon dioxide and ensure the consumer and energy

efficiency benefits flow to the low-income citizens most impacted not just by climate change, but energy costs as well.

Additionally, because carbon dioxide is not harmful in locally higher concentrations, and there do not appear to be specific Virginia plants in proximity to at-risk communities whose capacity factors would increase under a carbon program, a carbon market in Virginia appears unlikely to create "hot spots" of pollution in frontline communities. And as the cap for carbon emissions is lowered, it can also create additional benefits of further reducing associated co-pollutants that cause health problems in communities close to their source.

To ensure this is the case during the course of the program, the regular program review recommended below must also incorporate an annual environmental justice review, to confirm that local co-pollutants are being reduced as predicted and that the program is not imposing an impact on any local community in proximity of any generating unit.

Recommendation #7: The Regulation's Design and Emissions Impact Must Be Reviewed at Regular Intervals

Any new market will need to be adjusted to ensure it is functioning efficiently and is driving significant and additional carbon pollution reductions. Program reviews can ensure that the cap is set at the correct level to reduce carbon emissions well beyond BAU, while also maximizing the development of a clean energy economy in the Commonwealth. Virginia's program should thus undergo internal review on a regular basis, compatible and consistent with RGGI's program review process. This review process must include stakeholder and public input.

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SECTION 2: Modeling Results of a RGGI-linked Carbon Limit in Virginia

NRDC retained ICF International to conduct NRDC's analysis of a RGGI-linked Virginia carbon cap and subsequent reductions, by utilizing ICF's Integrated Planning Model (IPM®).[3]

NRDC's modelling indicates that capping carbon in Virginia with a well-designed program will significantly reduce carbon emissions, and at the same time: drive significant economic benefits for families and ratepayers; promote energy diversity and independence; and improve public health by lowering total co-pollutants across the state.

The full assumptions in NRDC's IPM modelling of a RGGI-linked carbon limit are below in Figure 1.

However, one important assumption bears noting: NRDC assumed the DEQ's RGGI-linked regulation requires a 3% annual decline in emissions starting in 2020 and continuing through 2030, from a projected BAU baseline emissions level in 2020. Based on the modeled results, discussed below, it is clear that *a 3% annual reduction is a lower-bound, conservative target that very likely lacks the stringency of the carbon reductions the regulation should require*.

The ease with which Virginia achieves a 3% annual reduction, as indicated by projected carbon allowance prices, indicates that the DEQ should make <u>deeper pollution reductions than 3% annually</u>, with at least a 4-5% annual reduction likely feasible, both economically and technologically. Cutting carbon pollution in this way is consistent with the urgent need to address climate change, and doing so at levels well above 3% annually is not only economically and technologically feasible, but would help further blunt the climate impacts noted above.

NRDC will conduct further modelling to confirm that a more robust annual reduction of 3% would: better protect human health, deliver net economic benefits, and comport with other successful carbon trading programs like RGGI.

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[3] ICF's Integrated Planning Model (IPM®) is a detailed model of the electric power system that is used routinely by the electricity industry and regulators, including RGGI, to assess the effects of environmental regulations and policy. IPM® determines the most cost-effective pathway for the electricity industry, subject to reliability requirements and environmental constraints, and economically builds & retires new electricity capacity. The outputs of IPM® modeling include carbon and other pollutants, wholesale electricity prices, natural gas prices, retail bills, electricity generation by fuel type, & capacity retirements & builds. The modeling presented here reflect an NRDC analysis conducted by ICF. All assumptions and policy scenarios were developed by NRDC.

Figure 1: NRDC's Modeling Assumptions

Element	No Action Case	RGGI-linked Case
Common Elements Across Modeling Cases		
Demand	AEO 2017 Reference Case without the Clean Power Plan	
Natural Gas Prices		
Technology Costs	Wind and solar costs from NREL'S 2016 Annual Technology Baseline; all other costs from AEO 2017. EE costs from LBNL.	
Policy Difference Across Modeling Cases		
Energy Efficiency	Current (2015) energy savings, equal to 0.1% annual savings.	Gradually ramps up savings to 1.5% annual savings by 2024. Held at 1.5% for rest of study period. Cumulative savings in 2030 are equal to 12% of retail sales before EE.
Import Constraint	No Constraint	Electricity import constraint of 20% of VA retail sales
Carbon Cap	No cap on Virginia emissions	Carbon cap in Virginia starting in 2020.
RGGI Participation	NJ joins RGGI in 2020	NJ joins and VA links to RGGI in 2020
Treatment of New States under RGGI Cap	Reference Case 2020 emissions from NJ added to RGGI cap	Reference Case 2020 emissions from VA and NJ added to RGGI cap
RGGI Emissions Trajectory	2.5% annual decline in RGGI Cap from 2020-2030.	3% annual decline in RGGI Cap from 2020-2030.
Other RGGI Assumptions	Allows banking of allowances	Carbon emissions from biomass facilities covered in Virginia. Allows banking of allowances.

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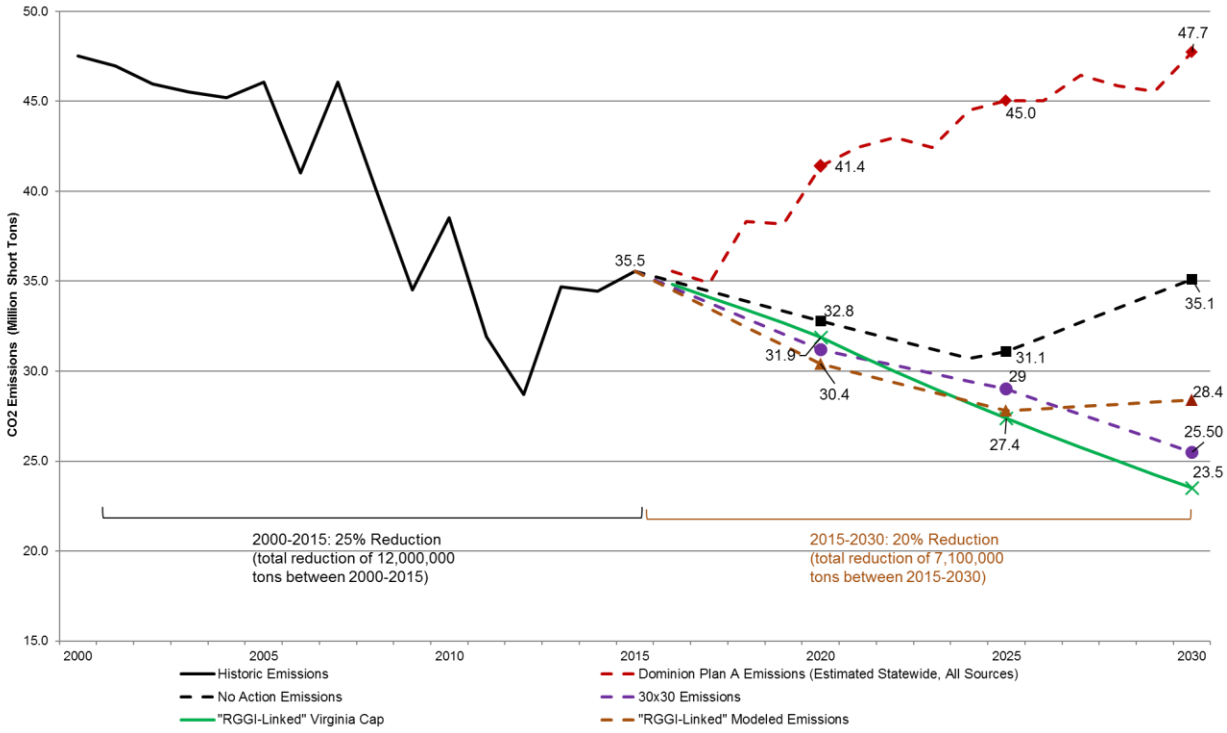
Emissions results: A RGGI-linked Carbon Limit Significantly Reduces Pollution (Figure 2)

As Figure 2 shows, a RGGI-linked, 3% annual reduction in carbon emissions between 2020-2030 would cap Virginia's 2030 emissions at 23.5 million short tons, a more than 30% reduction from 2015 levels. As Figures 3-5 show, this mitigation of dangerous climate change (and other pollutants) would also lower bills and increase Virginia's energy diversity and independence.

Figure 2: Emissions Impacts of Several Carbon Scenarios Compared to BAU "No Action"



Due to the significant economic and energy diversity benefits the modeled 3% annual reduction could deliver, NRDC recommends a more significant annual pollution reduction than 3%. Preliminary analysis indicates a 4-5% annual reduction in Virginia is feasible, due to already-planned coal retirements, untapped renewable energy, and energy efficiency reserves.

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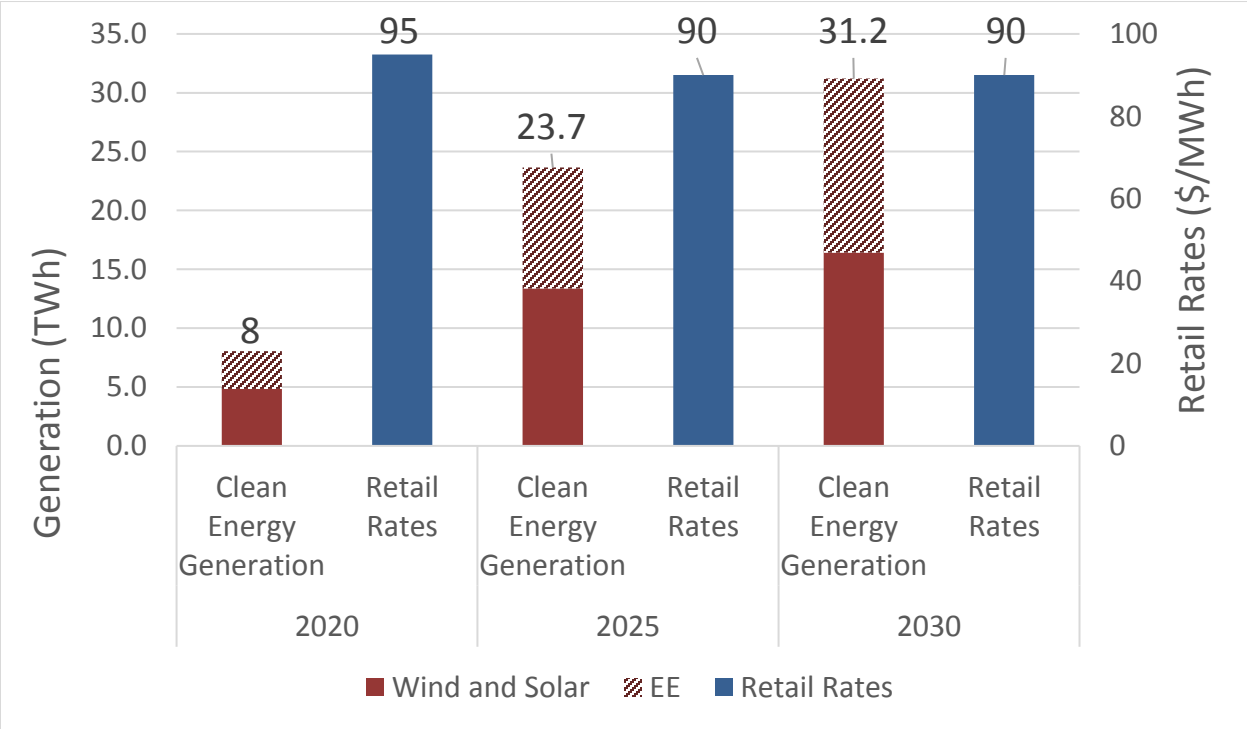
Energy independence: Imports Decrease from Current Levels (Figure 3)
NRDC's modelling of a RGGI-linked carbon cap and 3% annual reductions in Virginia shows the program would increase utilization of Virginia's native renewable and efficiency resources, and thus reduce energy imports from 2015 from 26.6 TWh in 2015 to 10.4 TWh in 2030.

Figure 3: Energy Independence and Reduced Imports

Net Imports (TWh)	2015	2020	2025	2030
No Action Case	26.6	20.2	18.6	10.3
RGGI-linked Case		19.1	14.0	10.4

Electric Rates: Retail Rates Decrease as Clean Energy Grows (Figure 4)
Reflecting the economic competitiveness of renewables and the lowest cost resource of energy efficiency, NRDC's modeling indicates that rates would decline over the 10-year course of the program, declining from $95/MWh in 2020 to $90/MWh in 2030.

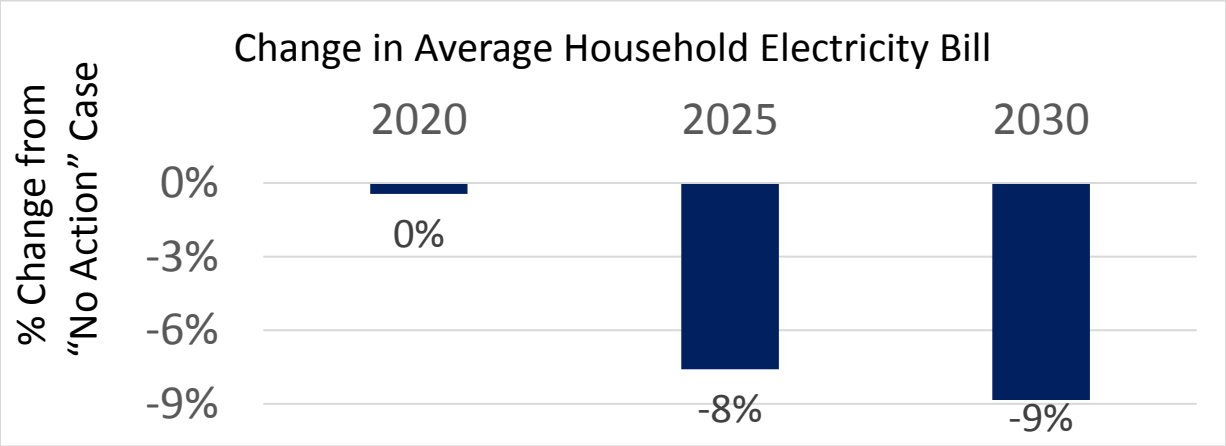
Figure 4: Decreased Rates and Increasing Clean Energy



Bills: Electricity Bills Decrease under a RGGI-linked Carbon Cap (Figure 5)

Largely owning to tapping Virginia's untapped energy efficiency resources (as well as expanding the state's supply of low cost renewable energy), electricity bills can be reduced by 9% in 2030 compared to business as usual.

Figure 5: Decreasing Energy Bills Along with Carbon Pollution



Carbon Costs: Carbon Allowances Prices Will be Modest (Figure 6)

A carbon allowance market in which Virginia links to RGGI and reduces carbon 3% per year would drive a carbon price of just $3.90/short ton in 2030. The lower carbon price indicates that a 3% annual carbon reduction is exceedingly modest. A 4-5% annual reduction could likely also be achieved with reasonable economic costs, while achieving greater climate mitigation and potentially more energy benefits from a quicker transition to available and low-cost clean energy and efficiency.

Moreover, this projected allowance price is a lower allowance price (delivering greater emission reductions) than in NRDC's previous modeling of a "30x30" carbon reduction.[4] This shows that Virginia can mitigate climate change with greater carbon pollution reductions, and at lower cost, by linking with RGGI, than by independently capping its carbon in a state-only approach.

[4] *See*, *generally*, "30x30: Virginia's Key to Climate Action and Growing the Economy," Natural Resources Defense Council, March 2017, *available at* www.nrdc.org/sites/default/files/30x30-virginia-key-climate-action-ip.pdf.

Figure 6: Projected Carbon Allowance Prices

Carbon Price ($/Short Ton)	2020	2030
"No Action" Case RGGI Price	$0.6	$0.9
RGGI-linked Case RGGI Price	$2.6	$3.9
"30x30" Case VA-only Cap Price	$0.0	$4.0

Health Impacts: A RGGI-linked Virginia Carbon Cap Directly Improves State Health (Figure 7)

Reducing carbon pollution also significantly reduces the co-pollutants nitrous oxide and sulfur dioxide. By 2030, those two pollutants would see additional reductions of over 45,000 tons by 2030.

Figure 7: Health Improvements by Reducing Co-Pollutants

Other Pollutants (Tons)	2020		2025		2030		Change in 2030	Estimated Cumulative Change in Emissions (2019-2030)
	"No Action" Case	"RGGI Linked" Case	"No Action" Case	"RGGI Linked" Case	"No Action" Case	"RGGI Linked" Case		
NOx	11,745	9,102	10,890	8,321	10,599	8,011	-2,588	-31,200
SOx	6,276	4,751	5,834	4,539	5,679	4,523	-1,156	-15,904

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Section 3: Allowance Allocation Effects and Design Options

The proposed regulation should be assessed not just on whether it secures meaningful reductions in carbon emissions and the related economic benefits of clean energy. The program should also be assessed by the consumer benefit delivered from such a plan: all emissions allowances have a dollar value as "discovered" in the marketplace.[5] In a freely-transferrable market, a dollar value for emissions allowances will develop without government intervention.

After allowance allocation, buyers and sellers, often with the help of emissions brokers, set a market price. The market then leaves plants owners with two options: (1). maintain emissions levels and purchase allowances or (2) reduce emissions levels and sell allowances to other plant operators for whom it is more cost effective to purchase allowances. In this market-based approach, the emissions reductions occur where cost-effective, and the allowances "flow" to the plants that will use them in a way that minimizes overall costs, while ensuring flexibility and system reliability.

Regardless of how the allowance was procured (for free or purchased, as discussed below), the dollar value of each held allowance must be included by generators in their wholesale market bids to PJM.[6] The value of allowances utilized by carbon emitters are then recouped by the generator when the electricity is sold. If the DEQ does not design a carbon regulation and allocation method that ultimately delivers that allowance value back to the consumer and Virginia families, such a giveaway would essentially serve as a publicly-subsidized windfall to generators, while consumers are unnecessarily saddled with higher costs.[7]

Thus, the program should be judged by the standard of whether or not the inherent full market value of allowances can be recovered from the generator that receives the electricity payment, and then reinvested in rebates, renewable energy, energy efficiency, and other investments that minimize compliance costs and maximize benefits to Virginia families. Conversely, the program should not allow the market value of allowances to accrue directly to generators as a windfall profit, with no benefit going to consumers to offset the higher wholesale electricity cost.

How the Value and Cost of Allowances Function

Regardless of how carbon allowances are allocated, the allowances function in the same way after the DEQ allocates them:

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[5] *See, e.g.,* SOX Market, NOX Market, and RGGI Carbon Market.

[6] *See* PJM Interconnection, LLC. *A Review of Generation Compensation and Cost Elements in the PJM Markets*. 2009, available at http://www.pjm.com/~/media/committees-groups/committees/mrc/20100120/20100120-item-02-review-of-generation-costs-and-compensation.ashx.

[7] *See generally* Grubb, et. al. *Climate Policy and Industrial Competitiveness: Ten Insights from Europe on the EU Emissions Trading System*. August 11, 2009.; Analysis Group, "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGI's Second Three-Year Compliance Period (2012-2014)," July 2015.

At the end of each compliance period, each generator must surrender sufficient allowances to cover all of its emissions during that period, as allowed under its DEQ air permit(s). Under IRS[8] and PJM[9] rules, the value of the allowances that must be surrendered in order to operate must always be included in a generator's bids into the wholesale market. Such inclusion of that value must be made, regardless of whether they had to purchase allowances (in which case the revenue can be reinvested on behalf of consumers) *or* received them for free (in which case the generator keeps the proceeds, in a significant wealth transfer from consumers to generators or utilities).

Determining the Best Allowance Allocation Method

While the basic framework of a carbon allowance program is relatively straightforward, the DEQ must decide in advance how it will initially allocate allowances. In doing so, the DEQ should ensure the inherent market value of the allowances accrues to Virginians and the Virginia economy---rather than simply result in a windfall to generators by distributing them to polluters for free; such an outcome would equate to customers in Virginia transferring millions of dollars from their pockets to the balance sheets of generators.

For example, according to the projected carbon allowance price of $3.90 in 2030 as outlined above in Section 2, the value of Virginia Virginia's allocated 23.5 million allowances in 2030 would be over $90 million in that year. That is real dollar value that the DEQ can ensure, through efficient regulatory design, is ultimately returned to Virginia families. Generators will likely claim that they need allowances to fund their investments in equipment to reduce emissions, but because they are reimbursed for the allowance cost in the wholesale market, free allocation would result in "double payment," at the expense of the consumer.

With that fundamental illustration of allowance value, we outline below three "menu" options for allocating valuable carbon allowances.

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[8] Code of Federal Regulations, Title 18, Conservation of Power and Water Resources, Part 101.
[9] PJM Interconnection, LLC. "PJM Manual 15: Cost Development Guidelines, Revision: 10". June 1, 2009. Pg 11. available at http://www.pjm.com/documents/~/media/documents/manuals/m15.ashx.

Allowance Allocation Option #1: Consumer Benefit Allocation through Consignment Auction

To ensure that the value of allowances is used for the benefit of bill payers, the DEQ could allocate allowance value on a pro rata basis to consumers via a consignment auction on behalf of electric distribution companies. Allowances (and subsequent dollar value) would be distributed based on each company's percentage of total state load (electricity need).

In this approach, the dollar value of the allowances (as determined in the marketplace in the consignment auction) can ultimately return to electric billpayers via their distribution company, under the direction and oversight of state regulators and other already-existing oversight bodies.
The allowances are allocated on a pro rata basis to consumers via the distribution companies, based on each company's percentage of total state load. For example, if the state's emissions budget for a compliance period is 100 tons, a distribution company with 70% of load would receive 70 allowances, a distribution company with 15% of load would receive 15, a co-op with 13% of load would receive 13, and a municipal with 2% of load would receive 2.

How those allowances are utilized would be overseen by the SCC, in close consultation with DEQ, utilities, efficiency providers, DMME, consumer advocates, the Clean Energy Virginia SAG, and other stakeholders, in the case of Dominion and APCo, and by the respective Boards in the case of co-ops and munis. Given the range of generator types and ownership structures, allowances should be sold in a transparent and open manner, with regulated monopoly generators competing in an open, transparent market with merchants. Sale and transfer of money from any one regulated monopoly affiliate to another should be supervised by the SCC.

The SCC would ensure, through the already existing IRP and rate cases proceedings, or perhaps through a new docket, that revenues from any allowances sold accrue to Dominion or APCo's bill payers' benefit. Indeed, the SCC likely has sufficient authority[10] to decide directly how the allowance revenues are utilized, to ensure maximum ratepayer benefit. Such benefits could take the form of cost-effective energy efficiency investment to lower customer bills (as well as further reduce carbon emissions from that distribution company); direct bill crediting; or investment in the most cost-effective zero-emissions resources to further reduce emissions and thus free up additional allowances. In RGGI, there have been significant benefits delivered to consumers as a result of investments of allowance proceeds.[11]

In the event Dominion or APCo must purchase allowances to meet the permitting obligations of one of their generators, SCC oversight can assure that such a decision to comply was the least-cost means available to the utility for meeting its generator's emissions obligations.

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[10] *See, generally,* Code of Virginia, Title 56. Public Service Companies, Article 1. In General. http://law.lis.virginia.gov/vacode/title56/chapter1/.
[11] *See, generally,* "The Investment of RGGI Proceeds through 2014," The Regional Greenhouse Gas Initiative, September 2016, *available at* www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_Report_2014.pdf.

Municipal boards and co-op boards would serve in a similar capacity, ensuring that any revenues or costs associated with selling or surrendering allowances ultimately serve the best interests of their bill payers.

Merchant generators would be assured access to allowances through sale of allowances by the distributions companies, and the subsequent open allowance market.

This approach is most preferred for its efficiency. Administratively, the DEQ already has experience with a similar NOX allowance allocation and auction.[12] Oversight bodies (the SCC and muni and co-op boards) are in place to ensure that allowance costs and related generation and compliance decisions are prudently incurred, and that any revenues are re-invested in such a way that serves the bill payers' best interests.

Allowance Allocation Option #2: Allocation to All Generators and Efficiency, Based on Output

A second approach to maximize economic value of allowances, is to allocate them to all generators of electricity or electric savings, including fossil generators, non-emitting generators, and verifiable energy efficiency providers, based on the previous MWh output of energy or energy savings. For example, if the compliance period budget is 100 tons, in a state that saw 100 MWh of output in the "baseline" period, three fossil generators that produced 25 MWh each would receive 25 allowances apiece. A solar plant that provided 5 MWh would receive 5 allowances, a nuclear unit that provided 15 MWh would receive 15, and an energy efficiency provider that delivered a verified 5 MWh of saved energy would receive 5.

Again, the marketplace would determine the allowance prices, with additional revenue through allowance trading and the energy markets flowing from higher carbon emitters to zero-emitting resources. In that way, the value of the allowances flow indirectly to the consumer, through the lower energy costs of additional zero-emitting resources and additional energy efficiency.

However, electricity customers would not directly receive the benefit of allowance-related revenue, nor receive the benefit of oversight of the disposition of such revenues.

[12] *See* Commonwealth of Virginia State Air Pollution Control Board. 9VAC5 Chapter 140. Regulation for Emissions Trading. Part III. NOx Ozone Season Trading Program, available at http://www.deq.virginia.gov/Portals/0/DEQ/Air/Regulations/c140p3.pdf and Virginia Department of Environmental Quality, "Virginia NOx CAIR Allocations and Forms," http://www.deq.virginia.gov/Programs/Air/AirQualityPlans/EmissionsTradingPrograms/VirginiaNOxCAIRAllocationsandForms.aspx (Accessed July 27, 2015).

Allowance Allocation Option #3: Allocation of Allowances Directly to Fossil Emitters

This method, most akin to the early sulfur dioxide acid rain reduction program in Virginia and elsewhere, would allocate allowances directly to fossil generators, based on each generator's share of total emissions.

This is the least economical method, because neither the state nor the bill payers recover any value; that value remains a windfall to generators and utilities. While the value of allowances would be included in PJM wholesale bids, no mechanism exists to ensure that recouped value (or the value of sold allowances) is returned to the final electricity customer. Indeed, this windfall would essentially create transfer payments from customers to generators.

If the DEQ pursues this approach, it should be acknowledged that the state has made a clear-eyed and directly attributable decision to transfer the potential $90 million value of allowances in 2030 from the businesses and families of the state directly to the pockets of the power plant owners.

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Figure 8 below outlines the considerations of different allocation mechanisms.

Figure 8: Considerations of Auction and Allocation Options

Approach:	**Auction of Allowances**	**Allocation to Customers via. Electric Distribution Companies**	**Output-based Allocation to All Generators**
Description:	State sells allowances and invests revenue in programs that reduce costs (energy efficiency) or help impacted communities (low income, environmental justice, worker transition).	Allowances allocated based on load and sold under SCC or Board oversight (open sale via consignment auction to ensure open access by all generators), with revenue used to reduce customer costs (energy efficiency, low income bill assistance, etc.).	Allowances allocated based on prior year(s) MWh of energy output or savings (fossil, non-emitting, energy efficiency).
Legal / Administrative Hurdles:	Collection of revenue by the environmental agency often requires funds go to state general fund, unless appropriations authority is granted by the legislature (legislation may be necessary).	Transfer of allowances to the distribution company may require an agreement with the state utility commission to oversee the sale and use of proceeds (environmental and utility regulator collaboration).	None (decision by environmental agency).
Legislature:	The legislature is likely to want to weigh in on the auction or allocation question. Significant value is at stake, and they or other stakeholders will want to influence where it is directed.		
Wholesale Energy Market:	Price on carbon flows cleanly through the wholesale markets, but increased costs can be offset by revenue from allowance sale.	Price on carbon flows cleanly through the wholesale markets, but increased costs can be offset by revenue from allowance sale.	Free allocation of allowances to some generators in excess of their need will reduce marginal costs and suppress bid prices in competitive markets, leading to lower wholesale electric prices.
Bill Impacts:	If allowance revenue is invested in energy efficiency programs or other bill assistance, total bills can be significantly reduced.	If allowance revenue is invested in energy efficiency programs or other bill assistance, total bills can be significantly reduced.	If energy efficiency programs do not expand as a result of the allocation (significant barriers will remain) total bills will rise.

Electric Utility Industry:	Most of the electric industry does not have a regulatory structure that is service based and aligned with keeping bills low. There remains a general preference for investing in power plants and not energy efficiency. Utilities may want the allowance value to flow to them in some manner but also will have a preference for approaches other than directing allowance value investment in efficiency.		
Energy Efficiency Industry:	Clean source of revenue to expand programs, assuming funding is secured.	Clean source of revenue to expand programs, assuming funding is secured at the SCC.	Some revenue would flow to them but it would be over time.
Support for Other Programs & Stakeholder Concerns:	Revenue to expand a wide-range of programs available, assuming funding is secured.	Revenue to expand electric sector programs available, assuming funding is secured.	No revenue.

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Section 4: Forest-derived Biomass Emissions Should be Included under the Cap

NRDC recognizes that there are many forms of biomass fuel currently used or under consideration in Virginia. These include landfill gas recovery, brewery wastes, agricultural plant residues and animal wastes, forest-derived materials including harvest residues and thinnings, energy crops, industrial/mill waste, and algae, among others. Many of these feedstocks can generate carbon benefits compared with fossil fuels. One in particular - forest-derived fuel - does not.

In these comments, we focus entirely on "forest-derived" biomass, by which we mean a biomass fuel sourced directly from a forest (whole trees, boles, harvest residues, tops, limbs, slash, and thinnings) - distinct from industrial and mill waste - and used to produce electricity.

Emissions from forest-derived biomass combustion - at dedicated units and through cofiring- must fall under the cap on CO_2 emissions: When establishing the statewide limits on $C0_2$, the agency must ensure that emissions from the combustion of forest-derived biomass to produce electricity - either through cofiring or in stand-alone plants - fall under the statewide emissions cap. EGUs that burn forest-derived biomass must hold allowances equal to stack emissions from that combustion, for several reasons.

First, as discussed further below in Section A, forest-derived biomass is not a "carbon neutral" fuel and its emissions cannot be discounted based on anticipated future mitigation through forest regrowth or avoided decay. In addition, "forest sustainability" certification schemes or other standards offer little information about carbon emissions from biomass burning and are in no way a proxy for "carbon neutrality" (see Section B below). Moreover, interstate trading of allowances with RGGI states does not prevent Virginia from including biomass under its own carbon emissions limit (see Section C below).

A. Forest-derived biomass is not carbon neutral, and biomass emissions cannot be discounted based on anticipated future mitigation through forest regrowth or avoided decay.

Stack emissions of CO_2 from burning forest-derived biomass are significant. They are typically comparable to or greater than coal per unit of energy produced (due to the inefficiency of biomass combustion), even according to industry analyses.[13]

Biomass proponents argue that these stack emissions can be mitigated in the future when new forests regrow on the harvested land, or by avoiding emissions that would otherwise occur through biomass decay on the forest floor. However, a host of research has demonstrated that there is uniformly a significant delay between combustion and the purported mitigation, during

[13] Kinney, Suz-Anne, "Wood vs. Coal: Moisture Content and Carbon Emissions," Forest2Market Market Watch, February 14, 2012, https://blog.forest2market.com/wood-vs-coal-moisture-content-and-carbon-emissions

which time carbon emissions persist in the atmosphere (carbon debt period). It is only after this time that forest bioenergy begins to deliver net carbon benefits compared with fossil fuels.[14]

A well-established body of peer-reviewed scientific analyses shows that burning trees and other large diameter materials for electricity creates a carbon debt for a period ranging from 35 to more than 100 years, even accounting for forest regrowth and avoided fossil fuel use.[15] In the case of burning forestry residues that would otherwise decay and release their carbon, the payback period is typically shorter, but still on the order of decades.[16] [17] Numerous studies have shown that forestry residues (including the "slash" left behind from logging operations) typically incur significant carbon debts.[18]

These timeframes are critical from both a scientific and policy perspective. The potential impact of CO_2 emissions in the short term on climate tipping points have been shown to be significant,[19] and limiting temperature increase to 2°C above pre-industrial levels requires large and immediate greenhouse gas emissions reductions. For example, Ricke and Caldeira (2014) recently found that the median time between an emission and maximum warming is 10.1 years.[20] Carbon emissions reductions must therefore be realized within short timeframes – measured in years, not decades - that are relevant to climate policy imperatives.

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[14] Buchholz, T., Hurteau, M., Gunn, J., and Saah, D., *A Global Meta-analysis of Forest Bioenergy Greenhouse Gas Emission Accounting Studies,* GBC Bioenergy, March, 2015.

[15] Mitchell, S., Harmon, M., and O'Connell, K., *Carbon Debt and Carbon Sequestration Parity in Forest Bioenergy Production*, GCB Bioenergy, May, 2012.
Colnes, A., et al., *Biomass Supply and Carbon Accounting for Southeastern Forests*, The Biomass Energy Resource Center, Forest Guild, and Spatial Informatics Group, February 2012
www.biomasscenter.org/images/stories/SE_Carbon_Study_FINAL_2-6-12.pdf
Hagan, J., *Biomass Energy Recalibrated*, The Manomet Center for Conservation Sciences, January 2012.
http://magazine.manomet.org/winter2012/biomass.html
Walker, T., et al., "Biomass Sustainability and Carbon Policy Study," Manomet Center for Conservation Sciences, June 2010, www.mass. gov/eea/docs/doer/renewables/biomass/manomet-biomass-report-full-hirez.pdf.

[16] Schulze, E. D., C. Körner, B. E. Law, H. Haberl and S. Luyssaert. 2012. *Large-scale Bioenergy from Additional Harvest of Forest Biomass is Neither Sustainable nor Greenhouse Gas Neutral*. GCB Bioenergy: 4(6): 611-616.
Stephenson, A. L., and MacKay, D., *Life Cycle Impacts of Biomass Electricity in 2020: Scenarios for Assessing the Greenhouse Gas Impacts and Energy Input Requirements of Using North American Woody Biomass for Electricity Generation in the UK*, UK Department of Energy and Climate Change, July 2014.
www.gov.uk/government/uploads/system/uploads/attachment_data/file/349024/BEAC_Report_290814.pdf

[17] Repo, A., et al., *Sustainability of Forest Bioenergy in Europe: Land-use-related Carbon Dioxide Emissions of Forest Harvest Residues*, GCB Bioenergy, March 2014.
Ter-Mikaelian, M., et al., *Carbon Debt Repayment or Carbon Sequestration Parity? Lessons from a Forest Bioenergy Case Study in Ontario, Canada,* GCB Bioenergy, May 2014.

[18] EPA has acknowledged that forestry residues, for example, may take 10-15 years to decompose if not used for bioenergy. Deferral for CO_2 Emissions From Bioenergy and Other Biogenic Sources Under the Prevention of Significant Deterioration (PSD) and Title V Programs: Proposed Rule, 76 Fed. Reg. 15249, 15259/1 (March 21, 2011). Other studies have shown that larger "residues" may take much longer to decompose. *See* Anna Repo, et al., *Indirect Carbon Dioxide Emissions from Producing Bioenergy from Forest Harvest Residues*, Global Change Biology Bioenergy, 2010.

[19] Executive Office of the President of the United States, *The Cost of Delaying Action to Stem Climate Change,* 2014.

[20] Ricke, R. L. and K. Caldeira, 2014. *Maximum Warming Occurs About One Decade After a Carbon Dioxide Emission,* Environ. Res. Lett. 9 124002.

Simply put, forest-derived biomass combustion does not result in contemporaneous or timely emissions reductions from affected EGUs and will not generate emissions reductions in timeframes that matter for avoiding the worst consequences of climate change. A priori assumptions about the "carbon neutrality" of forest-derived biomass are therefore unfounded, arbitrary, and scientifically indefensible.

Even putting aside the long period required to re-sequester carbon, post-harvest regrowth is not always assured. If a forest that has been harvested for bioenergy does not regrow, there is no basis whatsoever for claiming a CO_2 reduction credit. Yet the connection between the entity that burns the biomass and the entity that manages the harvested forest is usually limited or nonexistent, creating an overly burdensome task for the state and regulated facilities to ensure, monitor, and verify regrowth. EGUs simply cannot guarantee the regeneration of forests outside of their jurisdiction, so the claim of "carbon neutrality" amounts to an unverifiable promise.

Finally, tracking forest-derived biomass poses significant practical challenges. Especially in the case of slash and residues, which have no customary treatment (they are sometimes left on-site to decay and other times burned), it is very difficult to track feedstock origins and alternative fates, both of which are critical to determining their true carbon impacts. The VA state plan would need extraordinarily comprehensive monitoring and verification requirements—far beyond the resources likely to be available.

In sum, biomass fuel sourced from a forest (trees, boles, residues, slash, thinnings) cannot be demonstrated to meet any standard of low or zero emissions within relevant timeframes. Moreover, adequate monitoring and verification of forest-derived biomass feedstocks is costly and impractical. For these reasons, the state must ensure that all EGUs burning forest-derived biomass, whether co-firing or stand-alone, fall under the emissions limit and hold enough allowances to cover total stack emissions resulting from that combustion.

Certain categories of other types of biomass feedstocks very likely do not carry the same pitfalls. For example, true industrial wastes (such as black liquor and sawmill residues) as distinct from forest-derived biomass are more straightforward because these wastes are customarily burned and the combustion occurs at the facility that is generating the electricity.

These conditions would allow the state to determine and verify with a reasonable degree of confidence that the net carbon benefits are contemporaneous, occur onsite, can be tracked and reported relatively easily, and verified by the state at the EGU. Similarly, agricultural crop residues and animal waste do not carry a significant carbon debt because their rapid decay times make their carbon benefits contemporaneous without reliance on future mitigation over the long-term.

B. Virginia must reject "sustainable forestry" as a proxy for "carbon neutrality" of forest-derived biomass.

"Sustainability", however defined, is not a measure of carbon impacts. In other words, the concept or designation says very little, if anything, about the amount of CO_2 emitted by a given biomass source or the net effect of those emissions on atmospheric CO_2 concentrations over time. Below we assess two commonly cited instances in which sustainability is erroneously equated with "carbon neutrality."

(a) Best management practices (BMPs), forest certifications, and other "sustainable forestry" regimes.

Sustainable forestry is based on ecological and management considerations, not carbon accounting. Even if fully specified to include considerations of forest growth and removals, sustainability criteria will fail to fully account for changes in carbon emissions, and cannot be justified scientifically as a proxy for carbon accounting.

According to a recent summary in the *Journal of Forestry*:

> *An assumption that bioenergy harvesting in forests managed on a sustained yield (also called sustainable yield) basis does not create a carbon deficit is one of the most common errors in forest bioenergy accounting…Stating that sustained yield management is carbon neutral is incorrect because it fails to account for the case involving no harvest for bioenergy in the reference fossil fuel scenario.*[21]

As such, an established "sustainable forestry" certification regime or best management practice, while plausibly beneficial for ecosystems and wildlife protection, cannot be treated as carbon-beneficial. Carbon accounting is the only defensible means to determine carbon benefits.

(b) Reference point accounting.

Reference point accounting monitors carbon stocks over time across some pre-defined region, independent of the specific activities (logging, burning, emissions, etc.) that take place within that region. Under this approach, biomass harvested in regions where overall forest stocks are increasing is deemed carbon beneficial.

Such logic is erroneous an insupportable. Regional rates of forest growth simply cannot detect, quantify, or reflect the carbon emissions from an individual biomass-burning facility. The simplest way to understand this logical flaw is to imagine a biomass-burning EGU sited in a region where overall forest stocks are increasing, then that same EGU using the same feedstocks sited in a region where overall stocks are decreasing. Under the reference point accounting approach, the EGU in the first scenario would be considered to have zero stack

[21] Ter-Mikaelian, M., S. J. Colombo, and J. Chen. *The Burning Question: Does Forest Bioenergy Reduce Carbon Emissions? A Review of Common Misconceptions About Forest Accounting.* Journal of Forestry, 113(1): 57-68.

emissions, but not in the latter. Such an accounting method fails a basic test of logical consistency. It also decouples carbon emissions outcomes from the single most impactful factor: the EGUs choice of what biomass feedstocks to burn for bioenergy production. This significantly dampens incentives for biomass-burning EGUs to move away from sourcing known high-carbon sources of biomass and towards lower carbon sources.

Reference point accounting was roundly rejected by the U.S. EPA's own Scientific Advisory Board in its first assessment of the agency's Framework for Biogenic CO2 Emissions, and its position has not changed since then:

> *The choice of a fixed reference … implies that forest biomass emissions could be granted an exemption simply because the location of a stationary facility is in an area where forest stocks are increasing. The reference point estimate of regionwide net emissions or net sequestration does not indicate, or estimate, the difference in greenhouse gas emissions (the actual carbon gains and losses) over time that stem from biomass use. As a result, [it] fails to capture the causal connection between forest biomass growth and harvesting and atmospheric impacts and thus may incorrectly assess net CO_2 emissions of a facility's use of a biogenic feedstock.*[22]

A recent report by the Chatham House, a distinguished UK think tank with a history of independent and rigorous research, reached the same conclusion:

> *It is often argued that biomass emissions should be considered to be zero at the point of combustion because carbon has been absorbed during the growth of the trees, either because the timber is harvested from a sustainably managed forest, or because forest area as a whole is increasing (at least in Europe and North America).*
>
> *These arguments are not credible. They ignore what happens to the wood after it is harvested (emissions will be different if the wood is burnt or made into products) and the carbon sequestration forgone from harvesting the trees that if left unharvested would have continued to grow and absorb carbon. The evidence suggests that this is true even for mature trees, which absorb carbon at a faster rate than young trees.*[23]

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[22] U.S. Environmental Protection Agency, Scientific Advisory Board, Biogenic Carbon Emissions Panel, *Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources*, September, 2011. http://yosemite.epa.gov/sab/sabproduct.nsf/0/57B7A4F1987D7F7385257A87007977F6/$File/EPA-SAB-12-011-unsigned.pdf

[23] Brack, D., *Woody Biomass for Power and Heat: Impacts on the Global Climate,* Chatham House, The Royal Institute of International Affairs, February 2017. https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2017-02-23-woody-biomass-global-climate-brack-final2.pdf

C. Interstate Allowance Trading Does Not Prevent Virginia from Including Biomass under Its Own Carbon Emissions Limit.

Including the smokestack carbon emissions of biomass generators or co-firing generators would not affect Virginia's ability to link to other, pre-existing carbon markets like RGGI. So long as the allowances associated with the tons of carbon emitted from biomass or co-firing generators are indistinguishable from allowances from other carbon generators, covering biomass in Virginia would not distort larger carbon markets. Indeed, among in-state Virginia generators, including biomass generators in the program will eliminate the market distortions that would otherwise occur, where carbon emissions from biomass or co-firing generators are given a "free pass" and other carbon emitters must procure allowances. That is the very kind of carbon market inefficiency that the DEQ should avoid, in order to deliver lower costs to all.