Institute *for* Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

February 28, 2020

Attn: Transportation and Climate Initiative of the Northeast and Mid-Atlantic States

Re: Draft Memorandum of Understanding

The Institute for Policy Integrity (Policy Integrity) at New York University School of Law[1] respectfully submits these comments regarding the Transportation and Climate Initiative's (TCI) Draft Memorandum of Understanding (Draft MOU). Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decision making through advocacy and scholarship in the fields of administrative law, economics, and public policy.

As TCI participant-states develop a Final MOU, we encourage them to consider the following points:

1. "Affected Fuel[s]"[2] should include all transportation fuels that generate greenhouse gas emissions.
2. The "Regional Emissions Cap"[3] in conjunction with the "Stability Mechanisms"[4] should be set so the allowance price can reflect the external damages from carbon dioxide (CO_2) emissions.
3. Banking of allowances should be encouraged, however banking of allowances "without limitation"[5] should be implemented with caution.
4. "Offsets"[6] must be verified as real, permanent, and additional.

Section I of these comments provides an overview of TCI that highlights its key design features and some of its expected outcomes. That overview provides helpful background for Section II, which elaborates on the four points listed above.

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[1] This document does not purport to present New York University School of Law's views.
[2] *See* Draft MOU Appendix, § 2.A, https://perma.cc/TD6K-SNN5.
[3] *Id*, § 2.D.
[4] *Id*, § 2.G.
[5] *Id*, § 2.I.
[6] *Id*.

I. Overview of TCI

In 2010, eleven participant-states,[7] with support from the Georgetown Climate Center, launched TCI by signing a Declaration of Intent to "reduce greenhouse gas emissions, minimize our transportation system's reliance on high-carbon fuels, promote sustainable growth, address the challenges of vehicle miles traveled and help build the clean energy economy."[8] In the past year, those states have issued a Draft MOU and conducted a modeling exercise to assess TCI's effects on greenhouse gas emissions in participant-states, as well as its impacts on public health and the regional economy. The main features of the program described in the Draft MOU and its modeled effects are summarized here.

A. TCI Program Design

TCI is a cap-and-invest program aimed at reducing greenhouse gas emissions from fossil fuels used in the transportation sector. Though they are obviously related, the capping and investing aspects of the program are distinct. The emissions cap takes the form of a requirement that "regulated entities" must purchase allowances commensurate with the emissions attributable to their distribution of "affected fuels" during a compliance period. Effectively, the cap will assign a price to transportation fuel emissions that will fluctuate with demand for transportation fuels and the number of available allowances.

TCI participants' current plan is to set the cap just below the business-as-usual (BAU) level of transportation sector emissions and to then tighten it over ten years, from 2022 to 2032, by reducing the number of allowances available for purchase.[9] This tightening will cause regulated entities that most value affected fuels to continue purchasing allowances while other regulated entities look for ways to avoid purchasing as many allowances—or any at all. The final allocation of allowances in a given compliance period will be determined by a secondary market through which the regulated entities that value them the most will purchase them.

The investment aspect of TCI involves allocating the revenues from regulated entities' allowance purchases to projects that help achieve "TCI Program goals," such as the deployment of electric vehicles (EVs) and EV charging infrastructure, expansion of transit options, transit-oriented development, and the improvement of bike lanes, among other things. Even with a small allowance price, the revenue that would flow to such projects would be large.

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[7] Participants in 2010 included Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *See* THE TRANSPORTATION AND CLIMATE INITIATIVE OF THE NORTHEAST AND MID-ATLANTIC STATES, DECLARATION OF INTENT 3-4 (2010) [hereinafter TCI DECLARATION OF INTENT], https://perma.cc/ZWD8-WZZC. In 2018, Virginia signed on to the Declaration of Intent as well. Letter from Matthew J. Strickler, Sec'y of Natural Resources, State of Virginia, to Transportation Climate Initiative (Sept. 12, 2018), https://perma.cc/7RAQ-NVYS.

[8] TCI DECLARATION OF INTENT, *supra* note 7, at 1.

[9] *See* Transportation & Climate Initiative, Webinar: Draft Memorandum of Understanding & 2019 Cap-and-Invest Modeling Results (Dec. 17, 2019) (noting that BAU emissions are anticipated to decline by 19% between 2022 and 2032, and TCI's intervention would aim at a decline of 20%, 22% or 25%).

Importantly, TCI would not just gather revenue from emitters and channel it to investments that make for a cleaner transportation sector, while letting allowance prices fluctuate unfettered. Instead, several mechanisms, including the banking of allowances, long-duration compliance periods, the use of carbon offsets, and stability mechanisms, would prevent sudden and unpredictable price changes while also likely reducing compliance costs for regulated entities. Most significant to note are TCI's Cost Containment Reserve (CCR) and Emission Containment Reserve (ECR) of allowances. If compliance costs exceed a specified threshold, the CCR would trigger, loosening the cap. Similarly, if compliance costs fall below a specified threshold, the ECR would trigger, tightening the cap. In short, if properly designed and applied, the CCR and ECR would put into effect a ceiling and floor, respectively, for allowance prices.

B. Anticipated Benefits of TCI

TCI participants' parallel and coordinated implementation of the program in the Mid-Atlantic and Northeast transportation sector is expected to reduce greenhouse gas emissions, make a significant revenue stream available to states for decarbonization investments, and yield important co-benefits as well.

1. Greenhouse Gas Emissions Reductions

Nearly all TCI participants have pledged—separate and apart from their involvement with TCI—to reduce their states' respective contributions to the greenhouse gas emissions that cause climate change.[10] Meaningful action to address climate change must deal with the transportation sector, which is now the largest source of greenhouse gas emissions in the United States.[11] Given the scale and upward trend of emissions from transportation,[12] each state must adopt policies that go beyond those currently in place if they intend to fulfill their commitment to climate action.

TCI provides an opportunity for participant-states to jointly decrease their greenhouse gas emissions from affected fuels. Because the cap on emissions is designed to tighten over time, the program is expected to reduce emissions. Unlike pure quantity-based, command-and-control policies, TCI allows for cost-effective emissions reductions through an allowance market and flexible compliance mechanisms.

TCI aims to reduce greenhouse gas emissions from transportation by 20% to 25% between 2022 and 2032. This will translate into a modeled allowance price of five to seventeen cents per gallon in 2022 for the respective caps,[13] which is relatively low compared to the overall price of gasoline. This is also well within the range of historical price volatility: twenty-five of the past

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[10] *See* National Conference of State Legislatures, Greenhouse Gas Emissions Reduction Targets and Market-based Policies, https://perma.cc/WE33-8FZE (last updated Jan. 10, 2020) (indicating that all but two TCI participants have adopted emissions reduction commitments).

[11] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS, 1990-2017, at 2-24 (2019).

[12] *Id.*; *see also* Nadja Popovich and Denise Lu, *The Most Detailed Map of Auto Emissions in America*, N.Y. TIMES, Oct. 10, 2019, ("In nearly every metro area, total emissions have increased since 1990.").

[13] *See* TCI Webinar, *supra* note 9.

twenty-eight years experienced gas price fluctuations in excess of seventeen cents.[14] And so, the expected fuel price change for the proposed emissions cap is not expected to impact consumers much more than average price fluctuations.

2. Revenue Stream for Decarbonization Investments

Although TCI's allowance price could be small in magnitude relative to the price of gasoline, the widespread use of affected fuels in the TCI region would nonetheless deliver a large volume of allowance auction revenue to states—modeling suggests a range of $1.4 to $5.6 billion in 2022.[15] This pattern is expected to persist. Consequently, participant-states can expect a significant and steady flow of revenue from the sale of TCI allowances, even though those allowances will have a modest impact on fuel prices. Should TCI participants adopt a lower cap, whether at the outset or later, they would thereby raise the allowance price, which would in turn yield still more revenue for allocation by participant states.

Crucially, investments by participant states are expected to provide most of TCI's emission reductions. Although the change in the fuel price will reduce the use of affected fuels by some amount, it is widely established that demand for transportation fuels doesn't respond significantly to changes in its price.[16] For this reason, decarbonizing transportation requires infrastructure investments in the fleet of vehicles, the provision of public transit, and urban form. TCI supports this investment-based approach, while also discouraging the use of fuels by requiring regulated entities to hold emissions allowances.

The Draft MOU directs participant-states to invest program revenue in projects that further the program's goals, which include direct transportation sector CO_2 reductions and the development of low-carbon and resilient transportation options. These goals are broad enough to give states a great deal of flexibility, but not so broad that they fail to direct states' spending toward the objective of transportation sector decarbonization.

3. Significant Health, Safety, and Traffic Co-Benefits

TCI's sector-specific cap on greenhouse gas emissions from transportation fuels would yield valuable co-benefits by helping to:

- Reduce emissions of local air pollutants like $PM_{2.5}$, Nitrous Oxides, Volatile Organic Compounds, which are responsible for, among other things, increased rates of infant

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12. *See* U.S. Energy Info. Admin., *Weekly Retail Gasoline and Diesel Prices*, https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm (accessed Feb. 20, 2020).

15 *See* TCI Webinar, *supra* note 9.

16 *See* Jonathan E. Hughes, Christopher R. Knittel & Daniel Sperling, *Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand*, 29 ENERGY J. 1 (2008) (showing an elasticity of demand for gasoline between -0.03 and -0.08.); *see also* Nicholas Rivers & Brandon Schaufele, *Salience of carbon taxes in the gasoline market*, 74 J. ENVTL. ECON. & MGMT. 23 (2015). (showing how consumers respond differently to a permanent price change, than to price volatility.)

mortality,[17] premature births and low birthweight,[18] lung disease,[19] and even dementia in senior citizens,[20] as well as lower student test scores.[21]

- Reduce risk of serious or fatal harm from traffic accidents as individuals drive their fossil-fuel powered cars less often,[22] and drive slower.[23] Eventually, TCI will encourage the adoption of more fuel efficient and electric vehicles, which are more light-weight, further reducing the risk of serious of fatal harm to others.[24]

- Reduce traffic congestion as individuals choose alternative transportation options and drive less often.[25]

Currently the significant costs arising from each of these harmful externalities are not captured in fuel prices. Notably, the value of these co-benefits is expected to exceed the value of reduced greenhouse gas emissions. Preliminary estimates for the benefits of TCI show health benefits from \$3 to \$10 billion in 2032 alone—amounts well in excess of TCI's estimated climate benefits, which range from \$0.25 to \$0.89 billion by 2032.[26] These figures are consistent with prior research evaluating the effects of lower gasoline consumption.[27] In the United States, the benefits of reduced traffic congestion and increased safety from one less gallon of gasoline both outweigh the benefits of reduced greenhouse gas emission.[28]

Though it would be secondary to TCI's main objective of greenhouse gas emissions reduction, by partly internalizing those costs as well, TCI's program would make fuel prices more reflective

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[17] *See* Christopher R Knittel, Douglas L. Miller & Nicholas J. Sanders, *Caution, Drivers! Children Present: Traffic, Pollution, and Infant Health*, 98 REV. ECON. & STAT. 350 (2016).

[18] *See id.*; *see also* Janet Currie & Reed Walker, *Traffic Congestion and Infant Health: Evidence from E-ZPass*, 3 AM. ECON. J.: APPLIED ECON. 65 (2011).

[19] *See* J. Gasana et al., *Motor Vehicle Air Pollution and Asthma in Children: A Meta-Analysis*, 117 ENVTL. RESEARCH 36 (2012

[20] *See* Kelly C. Bishop, John D. Ketcham & Nicolai V. Kuminoff, *Hazed and Confused: The Effect of Air Pollution on Dementia* (Nat'l Bureau of Econ. Research, Working Paper No. 24970, 2018).

[21] *See* Wes Austin, Garth Heutel & Daniel Kreisman, *School Bus Emissions, Student Health and Academic Performance*, 70 ECON. EDU. REV. 109 (2019); Tess M. Stafford, *Indoor Air Quality and Academic Performance*, 70 J. ENVTL. ECON. & MGMT. 34 (2015).

[22] *See* Hughes et al., *supra* note 16.

[23] *See* Hendrick Wolff, *Value of Time: Speeding Behavior and Gasoline Prices*, 67 J. ENVTL. ECON. & MGMT 71 (2014). (Showing individuals drive slower when gas prices increase.); Arthur Van Benthem, *What Is the Optimal Speed Limit on Freeways*. 124 J. PUBLIC ECON. 44 (2015) (showing that increased speed leads to more traffic accidents).

[24] *See* Shanjun Li, Christopher Timmins & Roger Von Haefen, *How Do Gasoline Prices Affect Feet Fuel Economy?*, 1 AM. ECON. J.: ECON. POL'Y 113 (2009) (showing that higher gasoline prices increase fleet fuel economy); Michael Anderson & Maxamillian Auffhammer, *Pounds that Kill: The External Costs of Vehicle Weight*, 81 REV. ECON. STUD. 535 (2014) (highlighting how vehicle weight relates to risk-of-harm.); Antonio Bento, Kenneth Gillingham & Kevin Roth, *The Effect of Fuel Economy Standards on Vehicle Weight Dispersion and Accident Fatalities* (Nat'l Bureau of Econ. Research, Working Paper No. 23340, 2017) (highlighting how fuel economy standards can decrease the risk-of-harm from motor vehicle accidents).

[25] *See, e.g.*, Nicholas Burger & Daniel Kaffine, *Gas Prices, Traffic, and Freeway Speeds in Los Angeles*, 91 REV. ECON. STAT. 652 (2009) (showing that increased gas prices decreased congestion in Los Angeles).

[26] The health benefits do not include the benefits of reduced traffic congestion and risk of vehicular harm, and so, represent an estimate for the lower bound of co-benefits. The low monetized climate benefits are due to assumed BAU emissions slightly larger than the modeled cap on emissions.

[27] *See, e.g.*, IAN. W.H. PARRY ET AL, GETTING ENERGY PRICES RIGHT: FROM PRINCIPLE TO PRACTICE 6 (2014); Ian W. H. Parry & Kenneth A. Small, *Does Britain or the United States Have the Right Gasoline Tax?*, 95 AM. ECON. REV. 1276 (2005).

[28] *Id.* PARRY ET AL. 2014.

of the full set of costs imposed on society by transportation fuel consumption. Furthermore, these co-benefits make the cost-benefit analysis of TCI overwhelmingly favorable. As a whole, society would be more than compensated for the slight increase in fuel expenditure by decreased traffic, decrease pollution, and increased safety.

II. Considerations for the Final MOU

TCI participant-states should consider the following four points as they develop the Final MOU.

A. "Affected Fuel[s]" Should Include All Transportation Fuels that Generate Greenhouse Gas Emissions

The definition of "Affected Fuel" in the Draft MOU includes only "fossil fuel components of motor gasoline and on-road diesel fuel."[29] Participant-states initiated TCI to "work collaboratively in reducing greenhouse gas emissions from the transportation sector."[30] The definition of "Affected Fuel" would be better aligned with this goal if it included all transportation fuels that generate greenhouse gases emissions, such as biofuels, natural gas, and electricity, as well as fossil fuels.[31]

Excluding some fuels from the "affected fuel" category is a textbook example of an incomplete policy design and can lead to emissions leakage.[32] If the prices of some fuels that can substitute for motor gasoline and on-road diesel are unaffected by TCI, it is only rational that the implementation of TCI will drive some consumers to those fuels. If those fuels did not generate greenhouse gas emissions, this would serve the goal of TCI. But if these fuels generate a volume of greenhouse gas emissions per mile that is similar to motor gasoline or on-road diesel, then spurring consumers to switch will not serve TCI's goal of "reducing greenhouse gas emissions from the transportation sector."[33]

The treatment of biofuels, like ethanol and biodiesel, as unaffected fuels is of particular concern. These fuels easily substitute for motor gasoline and on-road diesel. Some vehicles can even use both options interchangeably, making the switching cost practically zero.[34] While biofuels are not fossil fuels, their lifecycle greenhouse gas emissions are nearly the same. For example, baseline gasoline's lifecycle carbon intensity is 98.2 kilograms of CO_2 equivalents per million

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[29] Draft MOU Appendix, § 2.A.

[30] TCI DECLARATION OF INTENT, *supra* note 7, at 1.

[31] *See* U.S. Energy Info. Admin., *Carbon Dioxide Coefficients*, https://www.eia.gov/environment/emissions/co2_vol_mass.php (accessed Feb. 24, 2020); U.S. Envtl. Prot. Agency, *Lifecycle Greenhouse Gas Emissions for Select Pathways*, https://www.epa.gov/sites/production/files/2016-07/documents/select-ghg-results-table-v1.pdf (accessed Feb. 24, 2020); California Air Resources Board, Carbon Intensity Lookup Table for Gasoline and Fuels that Substitute for Gasoline tbl.6, https://ww3.arb.ca.gov/fuels/lcfs/lu_tables_11282012.pdf (accessed Feb. 24, 2020).

[32] *See, e.g.*, Meredith L. Fowlie, *Incomplete Environmental Regulation, Imperfect Competition, and Emissions Leakage*, 1 AM. ECON. J.: ECON. POL'Y 72 (2009).

[33] TCI DECLARATION OF INTENT, *supra* note 7, at 1.

[34] For example, there are 46 "flex fuel" vehicles in model year 2019 listed at https://www.fueleconomy.gov/.

British thermal units (kgCO2e/mmBtu), whereas corn ethanol's lifecycle carbon intensity ranges from 60.6 to 117 kgCO2e/mmBtu depending on how the corn is processed.[35]

Substitute fuels that generate any greenhouse gas emissions will undermine the goals of TCI. Because they are not affected fuels, they do not count towards the total cap on emissions. So, the tightening of the cap will not reflect the true change in transportation greenhouse gas emissions. For example, if TCI's goal is to reduce greenhouse gas emissions from transportation by 20%, any increased use of substitute fuels that generate any greenhouse gas emissions would imply that the true reduction in greenhouse gas emission from transportation is less than 20%.

As currently written, the Draft MOU would establish a program that could encourage a significant increase in the use of alternative fuels but ignore—and so not reduce—their associated greenhouse gas emissions. Changing the language in section 2.A of the Appendix to the Draft MOU to "Regulated fuels shall include the greenhouse gas components of transportation fuels" would address this the problem of incomplete policy design and make the program more likely to reduce greenhouse gas emissions.

B. The "Regional Emissions Cap" in Conjunction with the "Stability Mechanisms" Should Be Set So that the Allowance Price Reflects the External Damages from Carbon Dioxide Emissions

The level of capped emissions is "the key factor in the environmental success of a cap-and-trade program."[36] There are many factors to consider when setting the cap. Economic theory states that an efficient environmental policy—that is, one that maximizes society's welfare—will price pollution externalities at the monetized value of their damages.[37] This efficient policy perfectly balances the costs of pollution against the benefits of the polluting activities.[38] Applying this theory of optimal policy design would mean setting an emissions cap so that the allowance price reflects the external damages of carbon dioxide.[39]

The best available estimate for damages of carbon dioxide is the Social Cost of Carbon, currently $52 per metric ton and increasing over time.[40] This implies that an allowance price of $0.46 per

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[35] EPA, *Lifecycle Greenhouse Gas Emissions for Select Pathways*, *supra* note 31.

[36] *See* Dallas Burtraw et al., *Economics of Pollution Trading for SO2 and NOx*, 30 ANN. REV. ENVTL. RESOURCES 253, 259 (2005).

[37] *See generally* A.C. PIGOU, ECONOMICS OF WELFARE (1929).

[38] *See* DALLAS BURTRAW, KAREN PALMER & DANNY KAHN, RESOURCES FOR THE FUTURE, A SYMMETRIC SAFETY VALVE 3 (2009), http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-09-06.pdf ("Policymakers advance economic efficiency when they set policy goals at levels that equate the marginal costs of additional pollution controls with the marginal benefits of improvements in environmental quality.").

[39] *See* Martin L. Weitzman, *Prices vs. Quantities*, 41 REV. ECON. STUDIES 477 (1974) (showing the equivalence of prices, like a carbon tax, and quantities, like a cap on emission, when there is perfect information on costs and benefits).

[40] Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12,866, at 4 (2016) [hereinafter "IWG SCC"], https://perma.cc/P6U5-PCYL. Prices have been updated to 2019 dollars using the Consumer Price Index.

gallon would address the externality of carbon dioxide emissions for gasoline combustion.[41] And as a result, the proposed cap reducing greenhouse gas emissions 25% by 2032—with a modeled allowance price up to $0.17/gallon in 2022—would be less strict than the cap that maximizes society's welfare and would thus inadequately address the harm to society of excessive CO_2 emissions.

At least two points argue for an allowance price higher than $0.46/gallon, supporting a stricter cap in turn. For one, a price of $0.46/gallon reflects only the carbon dioxide damages from gasoline and ignores other market failures that are correlated with gasoline use, which include local air pollution, upstream methane emissions, traffic congestion, and motor vehicle accidents. Given the empirical evidence that the external damages of these market failures are large, the cap should be stricter than whatever achieves $0.46/gallon.[42] Second, the best available estimate for the damages from carbon dioxide emissions ignores many important costs traceable to those emissions, such as extreme temperatures and changes in precipitation patterns.[43] Put another way, although there is broad consensus that the Social Cost of Carbon is a valid and useful metric, it is rightly understood as a lower bound on the damages of carbon dioxide.[44]

Setting an emissions cap that achieves a desired allowance price can be challenging. This is because of substantial uncertainty regarding several factors that affect the translation of cap to price, including the BAU emissions, the cost of reducing fossil-fuel use, and the effectiveness of related policies designed to address carbon emissions from transportation. Often, the uncertainty in the BAU emissions can be of similar magnitude to the reduction in emissions actually induced by a cap-and-trade program.[45] As a result, the equilibrium allowance price will likely come to equal the administratively set allowance price floor or ceiling.[46] This is especially true of a cap-and-invest program like TCI, where there is uncertainty in how well program investments will translate into reductions of transportation greenhouse gas emissions.

For this reason, setting the floor and ceiling for the allowance price is just as important as setting the cap. These administratively set limits on the allowance price insure against uncertainty about market conditions. A price floor insures against the risk of overestimated compliance costs,

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[41] U.S. Energy Info. Admin, *supra* note 331. There are 19.6 pounds of carbon dioxide in a gallon of gasoline and 8.89×10^{-3} pounds in one metric ton.

[42] Parry & Small, *supra* note 27.

[43] *See* INSTITUTE FOR POLICY INTEGRITY, ISSUE BRIEF: A LOWER BOUND: WHY THE SOCIAL COST OF CARBON DOES NOT CAPTURE CRITICAL CLIMATE DAMAGES AND WHAT THAT MEANS FOR POLICYMAKERS (2019).

[44] For example, the "high-impact" estimate from the Interagency Working Group on Social Cost of Greenhouse Gases, capturing the 95^{th} percentile of modeled damages from climate change is $149.40 per metric ton of CO_2 in 2019 dollars. IWG SCC, *supra* note 40. This suggests that the external damages of carbon dioxide from gasoline combustion is $1.33/gallon of gasoline.

[45] *See* Severin Borenstein et al., *Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design*, 109 AM. ECON. REV. 3953 (2019).

[46] *Id.*

possibly due to a lenient initial cap,[47] or an unanticipated economic downturn. Likewise, a price ceiling insures against an underestimation of compliance cost.

Currently, the Draft MOU proposes to establish an allowance price ceiling through a Cost Containment Reserve, and to give member states the option of raising the lowest possible price (establishing a price floor) by unilaterally withholding allowances through the Emission Containment Reserve. Currently, the draft MOU doesn't identify how these Containment Reserves are triggered, however their design is of upmost importance to the costs of TCI. Because the uncertainty in BAU emissions is likely to lead conditions where one of these Containment Reserves should be triggered, it is especially important that their design does not prevent the allowance price from aligning with the marginal external damages of carbon emissions.

In light of the foregoing points, we recommend the following:

i. In the Final MOU, explicitly state both the monetized damages of carbon dioxide generally based on the Social Cost of Carbon and also the damages per allowance. For example, "**WHEREAS,** transportation is a significant source of greenhouse gas emissions, the best available estimates imply each additional gallon of gasoline contributes at least forty-six cents to future climate change damages, and these damages are expected to increase overtime." Monetizing damages in this way would provide helpful context to stakeholders.

ii. Set the program's emissions cap so that an allowance price near $0.46/gallon of gasoline is achievable. A strict initial cap of this sort would address the problem of allowance over-allocation[48] and foster a robust market for allowances.[49]

iii. Design the Emission Containment Reserve to trigger if the allowance price is sufficiently low and the Cost Containment Reserve to trigger if the allowance price is sufficiently high, as the allowance price is the best measure of TCI's compliance costs. Ideally, the allowance prices that trigger the containment reserves—i.e., the price "floor" and "ceiling"—should be set symmetrically around a price at least as large as $0.46/gallon. Assuming the Social Cost of Carbon Adequately captures the costs to society of additional carbon dioxide emissions, this places equal weight on both risks: overestimating and underestimating the cost of compliance with TCI.

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[47] ***See*** Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*. 34 COLUM. J. ENVTL. L., 395 (2009) (describing how an over allocation of allowances depresses allowance prices).

[48] *Id.*

[49] Richard Schmalensee & Robert N. Stavins, *Lessons Learned from Three Decades of Experience with Cap-and-Trade*, 11 REV. ENVTL. ECON. & POL'Y 59 (2017) (observing that, in the context of U.S. Sulfur Dioxide Allowance Trading program, "a robust allowance market can be fostered through a cap that is significantly below [BAU] emissions.").

iv. Because the Social Cost of Carbon is a lower-bound on the damages from gasoline combustion, the allowance price that triggers the Cost Containment Reserve should be greater than $0.46/gallon.

C. Banking of Allowances Should Be Encouraged, However Banking of Allowances "Without Limitation" Should Be Implemented with Caution

Banking allowances between compliance periods can provide many benefits. The large uncertainty in BAU emissions makes it likely that the emission cap will be binding in some years but not all. For example, all else equal, if unforeseen geopolitical conflict causes the price of gasoline to increase in a given year, the quantity of gasoline demanded will decrease, regulated entities will meet their emission cap easily, and the TCI allowance price will be low (possibly zero if there is no price floor). If, however, the price of gasoline decreases in subsequent years, the cap will become binding, and the TCI allowance price will be high. Banking enables regulated entities to bank allowances when the cap is not binding and use those allowances when it is binding. By reducing volatility in the permit price, this option provides regulated entities with flexibility in complying with TCI and reduces uncertainty in relation to the cost of compliance.

Even if there were complete information on future compliance costs and BAU emissions, banking would still provide benefits to regulated entities as the emissions cap is tightened over time. Assuming constant BAU emissions, the tightening cap will increase the marginal cost of compliance over time. Recognizing this, rational regulated entities will reduce their emissions in the current period and bank allowances for future periods when compliance costs will be larger. As a result, they will face lower average costs of compliance across all periods.

Importantly, because banking reduces the compliance cost for regulated entities, a program that makes banking available can also adopt a stricter cap. For this reason, we recommend that TCI set a relatively strict initial emissions cap—sufficiently below BAU emissions—that takes into account the benefits of banking.

We also warn against making banking available *and* adopting a loose cap—near or above BAU emissions—because doing so can undermine program incentives to reduce emissions. That is, a loose cap can enable regulated entities to both avoid cost-effective reductions in their carbon emissions in the current period and bank allowances that can be used to avoid cost-effective reductions in future periods as well. This risk of banking—where regulated entities do not reduce emissions when it is cost-effective for them to do so—is greater if banked credits can be used in future periods without limitation.

In any cap-and-trade program, combining a lenient cap with unlimited banking will lead to low, or zero, allowance prices and little to no reduction in carbon emissions. This risk is especially important for a cap-and-invest program like TCI, where *revenues* (rather than the price of allowances) are the main source of expected emissions reductions and there is not necessarily a price floor. A low permit price implies lower revenues to member states, and thus less investment in decarbonizing infrastructure.

This concern about low allowance prices is not just hypothetical. The Regional Greenhouse Gas Initiative (RGGI) implemented two interim adjustments for banked allowances in 2014 to correct for the glut of banked allowances that resulted from adoption of a lenient initial cap, followed by an economic downturn that reduced total emissions from the electric power sector.[50] Those banked allowances reduced the allowance price significantly. The interim adjustments responded by reducing the number of auctioned allowances with the intention of "address[ing] the private bank of allowances."[51]

With this in mind, we recommend that TCI's participant-states do the following:

i. Consider how unlimited banking will affect the allowance price and compliance costs when setting the cap, and set the initial cap at an appropriately strict level. This cap should be well below BAU emissions, which will encourage a well-functioning secondary market for allowances.

ii. Establish a mechanism capable of reducing a potential glut of allowances, as RGGI's Interim Adjustments for Banked Allowances did. And, if the quantity of banked allowances grows too large or the allowance price falls too low, use that mechanism to reduce the number of emission allowances available to regulated entities. In principle, this could be accomplished by an Emission Containment Reserve that is triggered by low allowance prices, or many banked allowances.

D. "Offsets" Must Be Verified as Real, Permanent, and Additional

Offsets that reduce, avoid, destroy, or sequester carbon emissions or their equivalents can provide a flexible compliance mechanism for regulated entities that supports overall program compliance. With offsets, regulated entities that find it difficult to comply with TCI by reducing the sale of affected fuels can instead invest in projects that achieve the same reduction in greenhouse gas emissions, but at a lower cost. For example, with offsets, if consumers find it to be costly to reduce their consumption of transportation fossil fuels, and so regulated entities cannot reduce the sale of affected fuels, consumers need not reduce their consumption of fossil fuels if they can achieve a similar reduction in greenhouse gas emissions at a lower cost by reforesting land. In this way, the benefits of reduced greenhouse gas emissions remain the same while the costs to society are curtailed.

If offsets are properly designed, their availability can funnel private investments toward projects that reduce greenhouse gas emissions cheaply, and limit the burden of TCI compliance. If offsets

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[50] *See* REGIONAL GREENHOUSE GAS INITIATIVE, FIRST CONTROL PERIOD INTERIM ADJUSTMENT FOR BANKED ALLOWANCES ANNOUNCEMENT (2014), https://perma.cc/QDJ6-VYB3.

[51] *Id.*

are poorly designed, however, they can undermine the goal of TCI; the cap on emissions will not be achieved and the cost of greenhouse gas emission abatement will increase.

The most essential aspect of offset design is verifiable additionality. That is, for a project to qualify as an offset, it must yield carbon emissions reductions that would not have happened otherwise.[52] For instance, decisions to simply let a 50-acre forest stand, or to plant trees in a location where they would have grown anyway, would not yield additional emissions reductions and so should not qualify as offset projects. But decisions to halt and cancel the planned clear-cutting of a forest, or to acquire farmland and actively afforest it, would yield additional reductions and so could qualify as offset projects.

Further, it is essential for offsets to be verified as real and permanent. This requires diligent accounting of greenhouse gas emissions from any offset funded project, and the guarantee that the project will not be undone soon after completion.

Because verifying additionality and quantifying emissions attributable to offsets is difficult, offsets are a less reliable means of achieving emissions reductions than direct program compliance unless they are well designed. Further, even if the greenhouse gas emissions reductions accredited to offsets were precisely accurate and verifiably additional, offset projects are not guaranteed to provide the same co-benefits of TCI compliance described in the introduction to these comments, and so might not provide the same benefits overall.

For these reasons, some cap-and-trade programs have established direct limits on the amount of offsets that can be used for compliance: RGGI permits regulated entities to meet 3.3% of their compliance obligations by purchasing qualifying offsets;[53] California's Cap-and-Trade Program permits 8% of compliance obligations to be made up of offsets.[54] Instead of a hard, direct, limit on the use of offsets, we recommend strict guidelines on what qualifies as an offset, ensuring qualifying offsets are real, permanent, and additional. Naturally, strict guidelines on what is qualified as an offset will reduce the number of offsets available to regulated entities, and in this way, limit the use of offsets by regulated entities.

III. Conclusion

Adoption of a Final MOU by TCI participant-states would be an important step toward the coordinated reduction of transportation sector emissions in a way that is cost-effective. It would also yield important and valuable co-benefits in the region that far outweigh the costs of slightly

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[52] The California Air Resources Board provides links to several emissions offset protocols. Cal. Air Resources Bd., *Compliance Offset Program*, https://ww3.arb.ca.gov/cc/capandtrade/offsets/offsets.htm (accessed Feb. 24, 2020). New York's Department of Environmental Conservation has designated several categories of qualifying carbon dioxide emissions offset project. N.Y. Dep't of Envtl. Conservation, *CO2 Emission Offset Projects*, https://www.dec.ny.gov/energy/53449.html (accessed Feb. 24, 2020).

[53] Regional Greenhouse Gas Initiative, *Offsets*, https://www.rggi.org/allowance-tracking/offsets (accessed Feb. 9, 2020).

[54] JASON YE, CTR. FOR CLIMATE & ENERGY SOLUTIONS, SUMMARY OF CALIFORNIA'S EXTENSION OF ITS CAP-AND-TRADE PROGRAM 2 (2017).

higher gas prices. We encourage participant-states to adopt the recommendations above in order to ensure program effectiveness and integrity.

Respectfully,

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