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

November 30, 2017
Hon. Kathleen H. Burgess, Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

VIA ELECTRONIC SUBMISSION

Attn.: MATTER 17-01821
Subject: Comments on the Notice on Process, Soliciting Proposals and Comments, and Announcing Technical Conference

Dear Secretary Burgess:

The Institute for Policy Integrity at New York University School of Law[1] ("Policy Integrity") respectfully submits the following comments to the State of New York Department of Public Service ("DPS") and the New York Independent System Operator ("NYISO") on the Brattle Group's report *Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals* and on the implementation of a carbon price in New York. Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy. Policy Integrity has extensive experience advising stakeholders and government decisionmakers on the rational, balanced use of economic analysis, both at the federal and state level.

We are grateful for the consideration of these comments by NYISO and the DPS.

Sincerely,

Sylwia Białek, Ph.D.
Economic Fellow
sylwia.bialek@nyu.edu

Bethany Davis Noll
Litigation Director
bethany.davisnoll@nyu.edu

Jeffrey Shrader, Ph.D.
Economic Fellow
jeffrey.shrader@nyu.edu

Burcin Unel, Ph.D.
Energy Policy Director
burcin.unel@nyu.edu

[1] This document does not purport to present New York University School of Law's views, if any.

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I. Introduction

New York has committed to reducing greenhouse gas emissions through its State Energy Plan ("SEP"). The SEP calls for a reduction in state greenhouse gas emissions of 40% by 2030 and of 80% by 2050, relative to 1990 emission levels.[2] The SEP also calls for half of all electricity demand in the state be met by renewable generators by 2030. To achieve these goals, New York has pursued many successful programs to promote renewable energy and to price greenhouse gas emissions, including the Reforming the Energy Vision, the Clean Energy Standard, and continued participation in the Regional Greenhouse Gas Initiative ("RGGI"). Together, these policies have been contributing to substantial reductions in New York's greenhouse gas emissions, particularly in the energy sector.

The next step in pursuit of these goals should be to fully internalize the external cost of greenhouse gas emissions from the electricity sector. Policy Integrity, therefore, applauds the joint efforts by NYISO and the DPS to harmonize the state's energy polices with the operation of wholesale markets by implementing a carbon price within the wholesale markets. A well-implemented price on carbon will bring New York closer to achieving its decarbonization goals in a cost-effective manner.

As we outlined in our prior comments to NYISO and the DPS,[3] details of the design will help ensure that the maximum possible benefits are derived from the policy. Moving forward, NYISO and the DPS ("Joint Staff Team") should:

- Continue to focus on analyzing the implementation of a carbon charge since it is the economically preferred policy alternative;
- Carefully consider various design elements of the policy including the price, mechanisms to prevent emission leakage, and revenue allocation; and
- Perform additional analysis to better understand the effects of design alternatives.

II. Comments

The Brattle Group's report covers many of the benefits and issues surrounding the design and implementation of a policy to internalize the climate change externality in the wholesale market.[4] Below, we highlight some of the issues mentioned in that report and

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[2] New York State, *New York State Energy Plan*, (2015), *available at* http://energyplan.ny.gov/.

[3] Matter No 17-01821, *In the Matter of Carbon Pricing in New York Wholesale Markets NYISO/DPS Integrating Public Policy Task Force,* Institute for Policy Integrity Comments on Development of IPPTF Work Plan (Nov 10, 2017).

[4] SAMUEL A. NEWELL ET AL., PRICING CARBON INTO NYISO'S WHOLESALE ENERGY MARKET TO SUPPORT NEW YORK'S DECARBONIZATION GOALS (2017) [Hereinafter "Brattle Report"].

discuss additional considerations that have a potential bearing on the welfare implications of the policy.

A. A carbon charge is the best policy tool to price the environmental externality caused by greenhouse gas emissions in the electricity markets

Greenhouse gases warm the climate and therefore cause external damages. Because these damages accrue to third parties and are not priced within the market, greenhouse gas emissions must be addressed by public policy.[5] The first-best solution to a negative externality such as greenhouse gas emissions is to place an economy-wide tax on greenhouse gases.[6] In the absence of an economy-wide greenhouse gas tax, policymakers should, where possible, put a price on greenhouse gas emissions based on the amount of external damage caused by those emissions. Such pricing is crucial to fully internalizing the climate change externality and improving the efficiency of market outcomes.

In the New York wholesale energy market, a carbon charge is the most efficient way to implement a price on greenhouse gases because it fully internalizes the climate change externality. In keeping with the terminology used in the Brattle Report, we define a "carbon charge" as "directly set[ting] a $/ton price on carbon emissions, which NYISO would apply in its commitment, dispatch, and settlement."[7] A carbon charge, therefore, refers to the particular method or policy by which carbon is priced in the wholesale market.

In addition to increasing efficiency of the wholesale markets by internalizing the greenhouse gas externality, a carbon charge has several benefits:

First, a carbon charge is technology-neutral. Any method that reduces emissions of carbon can be used to reduce the burden of the charge. Unlike technology specific incentives, a carbon charge allows for flexibility in how emissions reductions can be achieved. Therefore, a carbon charge encourages the most cost-effective methods for carbon emission reductions by allowing the markets to choose the best technologies that can achieve emission reductions.[8]

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[5] M. Greenstone, E. Kopits & A. Wolverton, *Developing a Social Cost of Carbon for US Regulatory Analysis: A Methodology and Interpretation*, 7 REV. ENVIRON. ECON. POLICY 23–46 (2013).

[6] M.L. Weitzman, *Prices vs. Quantities*, 41 REV. ECON. STUD. 477–491 (1974) (providing the theoretical motivation for preferring taxes over emission quantity restrictions in the case of climate change). For direct support of a carbon tax, *see*, *e.g.* Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax is a Better Response to Global Warming than Cap and Trade*, 28 STANFORD ENVIRON. LAW J. 50 (2009).

[7] Brattle Report, *supra* note 4, at 18.

[8] *See, generally* CHARLES D. KOLSTAD, ENVIRONMENTAL ECONOMICS (2010).

Second, an appropriately priced carbon charge would increase the revenue received by generators that are less carbon-intensive than the marginal generator. Therefore, it provides incentives for entry of low or zero-emitting generation.

Third, a carbon charge provides valuable cost certainty for businesses. In particular, a carbon charge set according to the Social Cost of Carbon ("SCC") schedule published by the Interagency Working Group, as proposed in these comments, would always be known with certainty, and therefore will be predictable for all the market participants, reducing risk and the cost of new entry.

Fourth, a carbon charge also has the potential to provide locational incentives that will generate valuable co-benefits in terms of reduced local air pollution. In particular, high population areas, which are also the more frequently congested areas in the state,[9] currently experience relatively high levels of emissions of local air pollutants.[10] Because these areas generally have higher carbon-intensive resources, a carbon charge will increase the price differential compared to the other zones of the state, and incentivize construction of low-emitting generators that can displace high-emitting generators in these congested and high-pollutant regions. This displacement would achieve significant co-benefits.

Finally, a carbon charge will generate revenue that can be used to further enhance the efficiency of the policy. Depending on the goals of NYISO, DPS, and other stakeholders, revenue can be allocated to reduce leakage to other sectors, minimize bill impacts on consumers, further encourage investment in zero-emission energy generation, or for other purposes. Modeling and discussion will be necessary to understand the effects of these alternative measures.

It is important that the benefits of a carbon charge not be overlooked in the discussion of revenue allocation. Regardless of how revenue is allocated, an appropriately designed carbon charge will substantially improve the economic efficiency of the wholesale markets by internalizing the externality, and help achieve clean energy goals of the state.

B. The design of the carbon charge affects its efficacy

The design of the carbon charge is central to achieving its intended goals. The most important design element is the choice of the price level for the carbon charge.

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[9] Aleksandr Rudkevich & Pablo A Ruiz, *Locational Carbon Footprint of the Power Industry: Implications for Operations, Planning and Policy Making*, *in* HANDBOOK OF CO_2 IN POWER SYSTEMS 131–165 (Qipeng P. Zheng et al. eds., 2012) (showing that the highest levels of carbon dioxide emissions occur in the southern part of the state); Kathryn Hansen, *New NASA Images Highlight U.S. Air Quality Improvement*, *in* https://www.nasa.gov/content/goddard/new-nasa-images-highlight-us-air-quality-improvement/ (2014) (showing that this same area also experiences higher levels of non-carbon dioxide ambient air pollutants).

[10] U.S. Department of Energy, *National Electric Transmission Congestion Study*, (2015) at xiii.

Additionally, concerns about leakage need to be addressed to ensure that emissions reductions in the electricity generation sector in the state are not offset by emissions increases elsewhere.

i. The carbon charge should internalize the external damage of carbon emissions and therefore should be based on the Interagency Working Group's Social Cost of Carbon

The price paid per unit of emissions should be based on the monetary value of the external damage caused by those emissions.[11] As Policy Integrity has noted in many prior proceedings before the Commission, the Interagency Working Group's Social Cost of Carbon is the best estimate of these external damages caused by carbon emissions.[12] The Commission has already adopted the Interagency Working Group's SCC as the "best available estimate" of the marginal external damage of carbon emissions in many proceedings.[13] Here, NYISO and DPS should use the most recent estimate from the Interagency Working Group, issued in 2016, as the best estimate of the external damage.[14]

The Interagency Working Group first developed the estimate in 2010 and updated the estimate in 2013, 2015, and 2016.[15] In 2016 and 2017, the National Academies of Sciences issued two reports that recommended future improvements to the methodology.[16] In

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[11] Kolstad (2010), *supra* note 8.

[12] *See* Case No. 14-M-0101, *Proceeding on Motion of the Commission in Regard to reforming the Energy Vision*, Institute for Policy Integrity Party Comments on New York State Department of Public Service, Staff White Paper on Benefit-cost Analysis in the Reforming Energy Vision Proceeding (August 21, 2015); Case No. 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard,* Institute for Policy Integrity Party Comments on New York State Department of public Service, Staff White Paper on Clean Energy Standard (April 22, 2016); Case No. 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard,* Institute for Policy Integrity Comments on Staff's Responsive Proposal for Preserving Zero-Emissions Attributes (July 22, 2016); Case 15-E-0751, *Proceeding in the Matter of the Value of Distributed Energy Resources,* Joint Comments of Environmental Defense Fund and the Institute for Policy Integrity at New York University School of Law in Response to the Notice Soliciting Comments and Proposals on an Interim Successor to Net Energy Metering and of a Preliminary Conference (April 18, 2016).

[13] Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, New York Public Service Comm'n Case No. 15-E-0302, Order Establishing a Clean Energy Standard 134 (Aug. 1, 2016); Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to reforming the Energy Vision*, Order Adopting Establishing the Benefit Cost Analysis Framework (Jan. 21, 2016).

[14] In this discussion, we assume that the state is effective in preventing leakage. If the state cannot prevent leakage of emissions, then the optimal carbon price level would vary.

[15] *See* 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 12866* at 6–29 (2016) ("*2016 Technical Support Document*").

[16] Nat'l Acad. Sci., Engineering & Med., *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* 3 (2017); Nat'l Acad. Sci., Engineering & Med., *Assessment of Approaches to Updating the Social Cost of Carbon: Phase 1 Report on a Near-Term Update* 1–2 (2016).

response to those reports, Resources for the Future and the Climate Impact Lab are working on the next update.[17]

The Interagency Working Group's estimate has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office reviewed the Interagency Working Group's methodology and concluded that it had followed a "consensus-based" approach, relied on peer-reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research.[18] In 2016, the U.S. Court of Appeals for the Seventh Circuit held that relying on the Interagency Working Group's estimate was reasonable.[19] And though the current Administration recently withdrew the Interagency Working Group's technical support documents,[20] experts continue to recommend that agencies rely on the Interagency Working Group's Social Cost of Carbon estimate as the best estimate for the external cost of greenhouse gases.[21]

The NYISO and DPS should choose a charge such that the total price on carbon faced by generators is based on the Interagency Working Group's SCC. Given that different generators face different, sometimes overlapping policies, additional modeling and analysis will be necessary to determine the necessary granularity of the charge. For instance, if a generator currently pays a price on carbon only through its participation in RGGI, if RGGI permits are trading at $5, and if the current value of the SCC is $45, then the carbon charge for that generator should be $40 per ton to internalize the carbon externality.[22] The total amount a generator pays should be this per-unit carbon charge times its emissions rate.[23]

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[17] *RFF's Social Cost of Carbon Initiative*, Resources for the Future, http://www.rff.org/research/collection/rffs-social-cost-carbon-initiative (last visited Nov. 24, 2017); *Social Cost of Carbon*, Climate Impact Lab, http://www.climateprospectus.org/research-area/social-cost/ (last visited Nov. 25, 2017).

[18] U.S. Gov't Accountability Off., GAO-14-663, *Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates* 12–19 (2014).

[19] *Zero Zone, Inc. v. Dep't of Energy*, 832 F.3d 654, 677-79 (7th Cir. 2016).

[20] Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,095–96 at § 5 (Mar. 31, 2017).

[21] *See* Richard Revesz et al., *Best Cost Estimate of Greenhouse Gases*, 357 Science 655 (2017).

[22] Note that this is an illustrative example. The RGGI allowance price is based on a short ton of CO_2, while the SCC is calculated based on a metric ton. While calculating the actual carbon charge, proper conversions must be made. Generators might also be subject to other carbon prices in addition to or instead of the RGGI price. Further, the total amount a generator pays should be based on all greenhouse gases, in CO2-equivalent units, emitted by the generator to fully internalize the climate externality. Even though these comments use the term "carbon charge," the discussion applies to a charge for all greenhouse gas emissions. The best method for calculating CO_2-equivalence between different greenhouse gasses is presented in Alex L. Marten et al., *Incremental CH_4 and N_2O mitigation benefits consistent with the US Government's SC-CO_2 estimates*, 15 CLIM. POLICY 272–298 (2015). In addition, the price paid for greenhouse gas emissions due to their climate change externality should be separate from the price paid for any direct health effects or other externalities. The total payment for externalities from a given pollutant should be the sum of all external damages caused by that pollutant.

[23] Brattle Report, *supra* note 4, at 43 (setting the total carbon payment equal to the carbon charge times the *marginal* emissions rate of the generator). The most accurate way to apply the charge would be to levy it

In addition, smaller generators that do not participate in RGGI should face a higher carbon charge while RGGI participants should face a charge equal to the SCC minus the RGGI permit price, so that all generators pay the same total amount equal to the external marginal damage.

The state should do additional modeling to determine if all state goals—for instance the clean energy standard and decarbonization—are also met at this price level. If all goals are not met, then the state should create a scoping plan to determine which policies should be adjusted to achieve the goals in the most cost-effective manner.

ii. The carbon charge should be updated over time to reflect the best economics and science

The SCC increases over time to reflect the additional damage caused by rising temperature.[24] The IWG has published a schedule of SCC values for the next 33 years that incorporate these rising external damages. The carbon charge should increase according to this published schedule.[25] Such an increase would be public and predictable since it would be based on a set schedule.

In addition, the carbon charge should also be adjusted when updates to the IWG's SCC are published by Resources for the Future, the organization currently working on incorporating new scientific and economic knowledge into the SCC according to the recommendations by the National Academies of Sciences.[26] Because the timing of such updates is currently uncertain, a transparent mechanism and a timeline for updating the charge should be developed once the updates are published by Resources for the Future.

iii. Bilateral trades should not be exempted

Currently, about 40% of the energy settled in the day-ahead market is scheduled through bilateral contracts.[27] While the carbon charge could very easily be incorporated in New York's day-ahead and real-time energy auctions, it is crucial that those bilateral trades be

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based on the actual emissions, but the marginal emissions rate could be used if data on the real-time emissions are not available. The Staff will also need to assess how best to calculate emissions rates for advanced technologies such as energy storage. The net carbon dioxide emissions of an energy storage system depends on the difference between the carbon intensity of the type of resource that is used to charge the system and the carbon intensity of the type of resource that is displaced during discharging.

[24] *See 2016 Technical Support Document* at 6–29, *supra* note 13.

[25] *Id.* at 4.

[26] Resources for the Future, "Updating and Improving the Social Cost of Carbon," *available at* http://www.rff.org/research/collection/updating-and-improving-social-cost-carbon; Nat'l Acad. Sci., Eng. & Medicine, Valuing Climate Damages: Updating Estimates of the Social Cost of Carbon Dioxide 3 (2017).

[27] *NYISO Markets - New York's Marketplace for Wholesale Electricity*, NYISO http://www.nyiso.com/public/webdocs/media_room/publications_presentations/Other_Reports/Other_Reports/NYISO%20Markets%20-%20New%20Yorks%20Marketplace%20for%20Wholesale%20Electricity.pdf

covered by the same carbon pricing mechanisms. If they are not included, there is a potential for carbon-emitting generators to switch from bidding in NYISO's energy markets to individually negotiated power-purchase agreements, thus circumventing the carbon charge.

iv. How the carbon charge is levied changes the optimal design of other elements of the policy

The carbon charge could be levied as (1) an electricity generation carbon charge, (2) an electricity transaction charge, or (3) a mixture of the two. In the first case, the charge would be payable whenever a polluting generator produces electricity. In the second case, it would be paid whenever electricity is committed to be used by a load serving entity or an industrial facility. The transaction and generation charge approach would be equivalent if there were no energy imports to or exports from New York.

However, these two approaches may have different implications when energy trades between the state and neighboring areas are considered.[28] Depending on how a carbon charge is levied, the amount of leakage through imports and exports, and therefore, the optimal choice of how to design the border adjustments for electricity imports and exports, will be different.

v. Border adjustments must be considered to tackle the problem of out-of-state leakage through electricity imports and exports.

As discussed in the Brattle Report, leakages to neighboring areas can occur through changes in energy imports and exports (often described as "external transactions") if no border adjustments are implemented.[29] Addressing such potential leakage is important in achieving the State's goal of reducing greenhouse gas emissions. The optimal design of border adjustments depends on various factors such as how exactly the carbon charge is implemented and differences in marginal emission rates. [30]

A carbon charge levied on generation may lead to export and import leakages as described in the Brattle report. Because such a carbon charge would raise generation costs for all in-state non-zero emissions resources, those generators may choose to decrease their exports. In addition, if a charge is not levied on imports, then there will be an increased incentive to

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[28] With total net imports to New York from neighboring areas averaging nearly 2.9 GW during peak hours in 2016 and substantial total import capability relative to the load, the trades have significant impact on NYISO markets. Coordinated Transaction Scheduling allows trade prominent trade possibilities with ISO-NE. For a short summary of external transactions, *see* David B. Patton, Pallas Lee VanSchaick & Jie Chen, 2016 STATE OF THE MARKET REPORT FOR THE NEW YORK ISO MARKETS, Potomac Economics (2017), p. 45-52.
[29] Brattle Report, *supra* note 4, at 23-28.
[30] *See* Michael Keen & Christos Kotsogiannis, *Coordinating climate and trade policies: Pareto efficiency and the role of border tax adjustments*, 94 J. INT. ECON. 119–128, 124 (2014).

import (cheaper) electricity, disregarding the carbon content. If cheaper out-of-state resources are also more carbon intensive, a carbon charge can lead to an increase in total emissions.[31]

A carbon charge levied on transaction, on the other, applies to every generator selling to buyers in New York is subject to the charge. Therefore, in-state generators would be put on equal footing with the out-of-state energy suppliers and the incentive to reduce emissions would be present for all generators, whether they are producing locally or importing into the state. Any increase in imports from the current levels can happen only if the imported electricity is cleaner.

With a transaction tax, however, unfavorable changes in exports might occur. As the charge is highest for the most carbon intensive generators, their earning per MWh of electricity sold in New York would decrease. If the reduction in revenue in New York due to the carbon charge is higher than the additional costs these generators would have to incur to sell out of state, such as increased transmission and congestion costs, these generators may find it more profitable to export their energy instead of selling in New York's market. In such a case, some of the carbon savings in New York might be undone by emissions elsewhere.

In order to counteract the leakage, Staff should implement the appropriate border adjustments for interstate trades. For a carbon charge levied as a generation charge, the export-import border adjustment mechanisms as suggested in the Brattle Report are necessary to prevent leakage. For a carbon charge levied as a transaction charge, an export adjustment is needed since imports would already be addressed. While theoretically the two types of implementation might be equivalent, they might have different administrative costs.

vi. Potential RGGI leakage should be addressed, but institutional features of RGGI should also be considered in the analysis

As noted in the Brattle Group's report, a New York carbon charge can potentially cause emissions leakage through RGGI by reducing the demand for permits by New York generators, and therefore causing a fall in the price of permits. This fall in price would allow emitters in other RGGI-participating states to acquire permits at a lower price, potentially leading to increases in emissions outside of New York that could partially or fully offset the emissions reductions attained in New York.[32]

[31] For a description of the leakage mechanism see Brattle Report, *supra* note 4, at 23-26.
[32] Brattle Report, *supra* note 4, at 6-8.

The Brattle Group discusses two possible solutions to the issue of leakage of emissions from New York to other RGGI states: the retirement of allowances by New York and the purchase of allowances to offset leakage.[33] Some practical challenges should be considered with either options. First, the RGGI cap is currently set through 2020, and recently, the RGGI States agreed to a 30% reduction between 2020 and 2030.[34] Therefore, any additional cap reduction might not be feasible in the near term. Second, if the State chooses to purchase and retire RGGI permits to prevent leakage, then revenue, possibly from the carbon charge itself, will need to be utilized for that task.

When considering any of these issues or solutions, it is also important to note that institutional and market features of RGGI would prevent some leakage even in the absence of additional New York action. First, recent auctions for RGGI permits have cleared near the price floor. If the RGGI clearing price stays near the price floor, then RGGI leakage will not occur, as noted by the Brattle report.[35]

Second, the bank adjustment process can also help remove excess permits that might no longer be needed by New York generating units. The bank adjustment is currently set through 2020, but the recently proposed significant bank adjustments continuing with the RGGI states' historic willingness to implement additional bank adjustments when necessary to remove excess permits from the market.[36] A similar mechanism could be used to remove permits no longer demanded by New York generators.

Third, other RGGI states all have their own decarbonization goals.[37] A simple theoretical analysis would overstate the amount of potential leakage because if leakage begins to occur from New York to other RGGI participants, there will be incentives for all participants to work to stem this effect, either through reductions in the RGGI cap or through other means.

vii. The Joint Staff should consider the effect of the policy on leakage to other sectors, in particular transportation and heating

Other than impacts on electrification of transportation and household climate control, spillovers of the carbon charge to other sectors are expected to be limited.[38] The Brattle

[33] *Id.* at 7.
[34] *See* Regional Greenhouse Gas Initiative, *The RGGI CO_2 Cap*, (2017), https://www.rggi.org/design/overview/cap; *See* also Press Release, RGGI States Announce Proposed Program Changes: Additional 30% Emissions Cap Decline by 2030 (Aug. 23, 2017), http://rggi.org/docs/ProgramReview/2017/08-23-17/Announcement_Proposed_Program_Changes.pdf. [Hereinafter "RGGI Press Release"]
[35] Brattle Report, *supra* note 4, at 7.
[36] *See*, RGGI Press Release, *supra* note 35.
[37] Brattle Report, *supra* note 4, at 21.
[38] The effect of an electricity market carbon charge on other sectors will be governed by elasticities of substitution between electricity and other production inputs, *see, e.g.* Annegrete Bruvoll & Bodil Merethe

Group's report highlights the large share of carbon dioxide emission in New York that come from the transportation sector.[39] Therefore, reducing emissions from the transportation sector is an important element of achieving New York State's 80 by 50 goal. The state should carefully consider potential leakage to the transportation sector and consider whether modifications to the design of the policy are necessary. For example, reducing bill impacts by rebating revenue to customers would have the benefit of limiting effects that might hinder electrification of the transportation sector. Alternatively, such an outcome could also be achieved by directly using revenue to incentivize electric vehicles.

viii. Other climate policies run by the state need to be adjusted after the introduction of a carbon charge

The introduction of a carbon charge in the wholesale market will create questions of overlapping policies that will need to be resolved. In particular, the policies that are directly linked to monetizing the carbon externality will need to be adjusted to ensure that the incentives sent to energy generators are set appropriately. For example, as the Commission stated in the Clean Energy Standard Order, the Zero Emission Credits ("ZECs") may need to be modified or dismantled altogether.[40] Similarly, the value stack for the avoided carbon emissions in the Value of Distributed Energy Resources proceeding would have to be adjusted. Paying for avoided carbon emissions for these resources if the carbon emissions are fully internalized in the wholesale markets by a carbon charge would lead to double payments.[41]

On the other hand, for policies that have broader goals and are based on market mechanisms rather than directly priced carbon externality, adjustments may not be necessary. In the current design of REC markets, because the introduction of a carbon charge will increase wholesale energy prices and therefore the revenues received by renewable generators, the price of credits will decrease compared to a counterfactual no-

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Larsen, *Greenhouse gas emissions in Norway: do carbon taxes work?*, 32 ENERGY POLICY 493–505 (2004). The analysis there shows that the highest elasticities of substitution are between electricity and heating oil in households and in wood product manufacturing. New York-specific elasticities could be estimated to more fully understand this form of leakage.

[39] Brattle Report, *supra* note 4.

[40] Clean Energy Standard, *supra* note 20, at 144 ("The Commission also agrees and determines that the design and duration of the mechanism shall be such that it can be modified or eliminated by the Commission if there is a national, NYISO, or other program instituted that pays for or internalizes the value of the zero-emissions attributes in a manner that adequately replicates the economics of the program such that the Commission in its sole discretion is satisfied that the zero-emissions attributes are no longer at risk and that discontinuing the mechanism can be done in a manner that is fair to both the facility owners and the ratepayers.").

[41] Brattle Report, *supra* note 4, at 68.

charge scenario simply due to market forces.[42] The exact price change needs to be determined using comprehensive, dynamic models of energy markets.

C. Revenue allocation

In addition to increasing economic efficiency by internalizing an externality, a carbon charge will raise new revenue. The possible ways that this revenue is distributed bear on the efficiency, equity, and the political acceptance of a carbon charge.

i. The most economically efficient way to use revenue from an environmental tax is, generally, to reduce a pre-existing, distortionary tax

Economic research shows that using the revenue from environmental taxes (or charges) to reduce a pre-existing, distortionary tax is often the most efficient use for revenue. This argument has become known as the "double dividend": the first dividend, or benefit, is the reduction of a negative environmental externality. The second dividend is the benefits that occur due to a reduction in other distortionary taxes.[43] When judging the economic efficiency of alternative revenue allocation methods, using revenue to reduce a distortionary tax provides a relevant baseline for comparison.

ii. Other considerations for revenue allocation

Institutional requirements, legal authority, or other considerations might lead the policymaker and the public to prefer an alternative approach to revenue allocation. For instance, the DPS and NYISO are concerned with consumer bill impacts from a carbon charge. Additionally, because the charge will not be economy-wide, some stakeholders might be worried about effects on other sectors like consumer purchases of electric vehicles or more general incentives to purchase energy efficient, but electricity consuming, goods.

It is important to highlight that a carbon charge directly helps achieve both of these desirable goals, regardless of how revenue gets allocated. The Brattle Report focuses much

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[42] Note that REC prices might still increase significantly compared to current levels if the carbon charge is not sufficiently high to achieve the 50% by 30 goal.

[43] *See, generally.* A Bovenberg & LH Goulder, *Environmental Taxation and Regulation*, 3 *in* HANDBOOK OF PUBLIC ECONOMICS 1471–1545 (A.J. Auerbach & M. Feldstein eds., 2002). For discussion of conditions under which it is strongly preferable to use environmental tax revenue to reduce a pre-existing distortion, *see, e.g.* William K Jaeger, *The Welfare Effects of Environmental Taxation*, 49 ENVIRON. RESOUR. ECON. 101–119 (2011); A. Lans Bovenberg, Lawrence H. Goulder & Mark R. Jacobsen, *Costs of alternative environmental policy instruments in the presence of industry compensation requirements*, 92 J. PUBLIC ECON. 1236–1253 (2008); Antonio M. Bento & Mark Jacobsen, *Ricardian rents, environmental policy and the "double-dividend" hypothesis*, 53 J. ENVIRON. ECON. MANAGE. 17–31 (2007); Lawrence H. LH Goulder et al., *The cost-effectiveness of alternative instruments for environmental protection in a second-best setting*, 72 J. PUBLIC ECON. 329–360 (1999).

of its analysis on consumer bill impacts and shows that almost half of the impact will be reduced by declines in REC and ZEC prices as well as generator efficiency improvements.[44]

Similarly, the carbon charge sends a signal to invest in cleaner, alternative energy and heating sources as well as energy storage technology.[45] As we described above, the price raises the effective marginal cost of production of electricity by carbon-intensive fuel sources. This will incentivize clean generators to enter the market, so even if revenue is not reallocated to clean energy producers, the carbon charge will still provide an incentive for increased clean energy production.

Moreover, recent research shows that Americans, on average, are willing to pay up to $15 more per month on energy bills to tackle climate change.[46] For consumers in New York, this value is likely even higher, given that New Yorkers show much stronger support for policies to address climate change than the national average.[47] Therefore, allocation of revenue to reduce bill impacts does not appear to be necessary to get consumer support for a carbon charge in New York.

If revenue is used to reduce bill impacts, it should be done in a way that it does not dull the incentive for individuals to conserve electricity. Typical economic modeling suggests that lump-sum transfers of revenue back to consumers—for instance by paying customers an annual rebate on their bill based on the cumulative regional carbon charge—are the appropriate method to allocate revenue without dulling this incentive.[48] Recent research, however, shows that consumers care about the average, rather than the marginal, electricity price that they pay.[49] This result means that lump-sum transfers might still be interpreted by consumers as an incentive to reduce efforts at conservation.

D. More dynamic and transparent modeling is necessary to determine the most effective design.

The Brattle Report provides excellent analysis to understand many of the potential effects of a carbon charge. However, it focuses on the effect of a carbon charge on customer bill impacts, so further study is needed for a comprehensive understanding of the effects of the

[44] Brattle Report, *supra* note 4, at 39.
[45] Energy storage in areas of high emissions and frequent congestion, for instance, could purchase energy from low emitting sources during times of low congestion, then release it during times of high energy demand, receiving a high price for energy both due to the LMP and due to the carbon charge.
[46] Matthew J Kotchen, Zachary M Turk & Anthony A Leiserowitz, *Public willingness to pay for a US carbon tax and preferences for spending the revenue*, 12 ENVIRON. RES. LETT. 5 (2017).
[47] Peter D. Howe et al., *Geographic variation in opinions on climate change at state and local scales in the USA*, 5 NAT. CLIM. CHANG. 596–603 (2015).
[48] Kolstad (2010), *supra* note 8.
[49] Koichiro Ito, *Do consumers respond to marginal or average price? Evidence from nonlinear electricity pricing*, 104 AM. ECON. REV. 1–55 (2012).

charge on the market. Most importantly, analysis is needed to understand the effects of the charge on entry and exit of generators.

Modeling the exact impact of a carbon charge on states' goals like composition of generators, is challenging due to the dynamic nature of the energy markets and complex interactions between carbon pricing and other policies. A detailed, long-run modeling of the entry-exit decisions, based on the thorough understanding of energy and capacity markets is necessary to inform the policymakers and the public how the charge can contribute to transitioning to a clean energy mix.

Setting the proper entry and exit incentives is crucial for cost-efficient transition to clean energy, advanced energy technology, and the long-term adjustments in the energy markets that shift the energy mix to the socially optimal. Bearing that in mind, more effort should be spent on modeling the market dynamics that thoroughly consider incentives to exit and enter to reflect how a carbon charge will affect the generation landscape and, consequently, the long-term emissions.

The simple assumptions in the Brattle report underestimate the potential changes in energy storage, entry of clean resources and exit of inefficient generations, which underestimate emissions effects.[50] Similarly, some of the dynamic responses such as the changes in REC prices payments could be more easily answered with a full-blown model instead of using ad hoc assumptions.[51] The usage of more advanced modeling could reinforce the predicted impact on the charge on emissions.

III. Conclusion

Setting an appropriate price on greenhouse gas emissions is crucial to internalizing the climate change externality. Currently, the price paid for carbon emissions by power generators in New York is below the level that is necessary to fully internalize the climate change externality. An additional price on carbon, levied in the form of a carbon charge set at least as high as the SCC would address this important issue in an economically efficient way. Carefully choosing elements of the policy design will help ensure that the

[50] The methods used in the Brattle Report for eliciting dynamic effects, in particular for entry and exit behavior, are not entirely clear and transparent. The analysis does not consider the possibility of new entry of renewables induced by a carbon charge or increased battery usage. The potential increase in combined-cycle generation (CC) due to carbon pricing discussed in the "Benefits of Pricing Carbon into the Wholesale Energy Market" section also does not seem to be consistently reflected in the conclusions of the report. In the "Plant Revenues" analysis, Figure 13, no changes are predicted for downstate oil-fired peaker energy revenue with the explanation that "Downstate peaking units (…) receive capacity payments but rarely run for energy (…)". The unchanged energy revenue, however, does not seem compatible with new entry of CC. Even if the peak plants are used infrequently, they would still see their revenue fall.

[51] In particular, the assumption of carbon charge replacing the RECs one-to-one seems to stand on tenuous grounds and disregards the fleet's composition.

policy is successful. We encourage the Joint Staff to continue thorough discussion of design details and to do additional modeling to fully understand the effects of different methods of revenue allocation, dynamic effects on entry and exit, and other crucial design details.